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THE AGRICULTURAL GAZETTE OF CANADA

Vol. IX November-December, 1922 No. 6

STORAGE

LEADING TOPICS

Graduate Study in Agriculture
The Cap Rouge Experimental Station
Inspection of Meat and Canned Foods
Fruit and Vegetable Marketing
Agricultural Instruction Grant in British Columbia, 1913-22
Résumé of Agricultural Instruction in Prince Edward Island
Dairying at the Oka Agricultural Institute
Agricultural Instruction in Elementary Schools
Pasteurization and its Effect on the Vitamin Content of Milk

DEPARTMENT OF AGRICULTURE
OTTAWA, CANADA

The Agricultural Gazette of Canada is published bi-monthly, in English and in French, by the Dominion Department of Agriculture, Ottawa.

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The Agricultural Gazette is not intended for general distribution. It is sent free to agricultural workers and teachers, including school teachers who have agricultural teaching qualifications; to members of parliament; to libraries; to the Press, and, as an exchange, to institutions in other parts of the Empire and in foreign countries.

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The AGRICULTURAL GAZETTE
OF CANADA

J. B. SPENCER, Director of Publicity
Wm. B. VARLEY, Editor

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OTTAWA

MAP OF CANADA SHOWING THE LOCATION OF FARMS, STATIONS AND SUB-STATIONS IN THE EXPERIMENTAL FARMS SYSTEM, THE AGRICULTURAL COLLEGES AND AGRICULTURAL SCHOOLS

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The AGRICULTURAL GAZETTE
OF CANADA

VOL. IX NOVEMBER-DECEMBER, 1922 No. 6

GRADUATE STUDY IN AGRICULTURE

At the Second Annual Convention of the Canadian Society of Technical Agriculturists held at Macdonald College in July last, the Principal of that institution, Dr. F. C. Harrison, introduced the subject of Graduate Study in Agriculture. Because of the importance of the matter to Canadian Agriculture and the desire that exists among graduates that facilities for Post-Graduate work be made more fully available within the Dominion, it has been decided to publish Dr. Harrison's address. As a further contribution to the subject, an expression of views has been secured from the heads of a number of institutions directly concerned. — *Editor.*

DR. F. C. HARRISON, PRINCIPAL, MACDONALD COLLEGE

MODERN education has reached a very intensive stage. In the last fifty years the progress has been phenomenal. Discovery has trod on the heels of discovery, science has laid bare the secrets of nature, new sciences have emerged with a leap like Pallas Athene who sprang forth from the head of Zeus with a mighty war shout and in complete armour. In her, power and wisdom were harmoniously blended, and our modern sciences quite fittingly take her place. Commensurate with this progress and advance of science, we have been brought to an age of specialism as it is impossible for one man to master even the whole of a science, and the interlocking of many sciences has brought forth the necessity for broad and comprehensive training. For example, thirty years ago there was a professor of Natural History and Geology at the Ontario Agricultural College. Some years later his work was divided and professors of Horticulture, Botany, Entomology, and Bacteriology were created. These have again been subdivided in some of our Canaadian institutions and the sub-division has been even more extensive in American agricultural colleges. For example, instead of a professor of Botany there may be found professors of Economics, Botany, Ecology, Cryptogamic Botany, Plant Pathology, Algology, etc. Entomology has also been divided and we have professors devoting themselves to a single order. This evolution takes place more intensively in other sciences, until teachers have found that it is impossible to cram into four years of undergraduate life, all that is thought necessary for such a man to know. Hence, in a number of faculties the course has been considerably lengthened. For example, in medicine six year courses are quite common, and after the completion of such a course a graduate walks the hospitals for several additional years. In some institutions the B.A. is necessary as a prerequisite to registration in medicine.

In law, the courses have been lengthened. In many institutions the B.A. is required for entering the study of law.

In arts, men who specialize in History, Economics, Education, are bound to go forward for advanced degrees if they desire to find situations.

In applied science, the same course is followed, e.g., chemical engineers, mining and electrical engineers, etc., have to spend considerable time in apprenticeship before they can find situations.

How is it in agriculture? Let us first examine the field. Agriculture in many respects closely approaches medicine. The sciences of Chemistry, Biology, Physics, Bacteriology, in their widest application, are the foundations on which both sciences are built. The undergraduate in agriculture has a very large number of subjects to assimilate. In addition to the sciences mentioned there are the professional subjects, Animal Husbandry, Agronomy, Horticulture, Poultry, Farm Engineering, English, Economics, Mathematics, and in the attempt to reduce the number of subjects, many institutions permit students to either specialize or select certain subjects in order to reduce the task of the student. Often the result is the building of a rather frail foundation in the science subjects, and the general result may be stated by saying that after four years of study, really amounting to about 32 months of lecture and laboratory work, the student is ready to go forward, and, if of sufficient standing, to take up postgraduate work. But if the exigencies of medicine call for now at least six years of work and more often seven and eight, surely agriculture needs as much for men who are to teach or do research work.

In a few words, the amount and nature of work in agriculture is now so large that it is impossible for the average student to obtain the necessary training and assimilate the necessary facts in four years of undergraduate work.

The field of research is vast, and the results that may be expected from well planned and properly carried out research have the added stimulus that such work is of high practical utility.

The soil offers many problems, its biological activities, the solution of the soil acidity problem in the East, and the probability of its relation to soil toxicity, clover sickness, etc., the aerial denudation of soils in the West, the quick decomposition of vegetable debris like straw, the unlocking of the fertility, the treatment of alkali soils, etc. With these are related problems in tillage, drainage, irrigation, dry farming, etc.

The plant offers inexhaustible problems—yields, early maturity, hardiness, breeding for disease resistance, breeding for certain chemical constituents. Its relation to disease induced by fungi, bacteria and insects—methods of control and prevention, involving a profound knowledge of the sciences, Genetics, Biochemistry, Botany, Plant Pathology, Bacteriology, Entomology, etc.

The animal likewise involves problems in breeding and Genetics, Chemistry of Nutrition, Biochemistry, Veterinary Science. How much may the science Biochemistry come to the assistance of the cattle feeder? How has the discovery of vitamines altered our conception of the feeding of the young and adolescent animal? Then there is the problem of calcium assimilation. Have we an intelligent conception of contagious abortion, of goitre and its causes, of methods of dealing with tuberculosis, and many more diseases to which all kinds of stock are subject? Further, there are the products from plant and animal, the problems of the dairyman in his provision of clean milk, good butter and cheese and wholesome by-products. There are also the numerous problems connected with farm engineering, sanitation, drainage, mechanics of farm power, etc. Truly the number of subjects is vast and the opportunities are many.

What are we doing to cope with these large and small problems? Are we seized with the importance of thoroughly training men to devote their time to such work? What kind of training should we give? How can we induce our

graduates to see the importance of this work? These are some of the questions that we may ask ourselves.

Two kinds of advanced work seem to be indicated:—

1. Preparation for teaching, including not only the training of men for teaching in our colleges, but also training for extension work, which in the final analysis is a form of teaching.

2. Preparation for research work.

In both the immediate aims differ from those of undergraduate study. The graduate student must learn to develop the power of independent work, to become filled with the true spirit of research, to specialize without becoming narrow, to read widely and become familiar with the literature of his chosen subjects.

With regard to teaching or degrees for agricultural education, it may be noted that in certain institutions in the United States, a very large number of Doctor's degrees are granted every year in the subject of education. Columbia and Chicago, to mention two institutions, have very numerous students taking work in higher education. We need a degree in agricultural education; we require men who, while technically well supplied with material, need extensive courses in the principles of vocational education, in methods of teaching, practice teaching and research in education. Even if we do not go so far as the Doctor's degree, more might be done to equip men by an extra year's training in the subjects above mentioned. Men with this training should also be able to give better service in extension work, as they would know how to present their subjects in the best manner to a farmer audience.

For research men, who desire to take either their Master's or Doctor's degree course work, the acquisition of a reading knowledge of two languages and a problem or thesis showing distinct originality together with a mastery of the literature of the subjects chosen are the usual requirements for any kind of degree. But no matter what line the student may elect in agriculture, he is practically forced to take intensive courses in one or other of the sciences. For example, if he desires to go forward to an advanced degree in Animal Husbandry, he will need a thorough grounding in Genetics including the cell, cytology and embryology. In Nutrition he will need Animal Chemistry, Biochemistry, the Physiology of the Digestive Glands. The same is also true for men who desire to specialize in Poultry. The Horticultural specialists will need courses in Genetics, Botany, and one or other of its sub-divisions, the Chemistry of Soils and Fertilizers. Students who desire to specialize in the Soils will find a very heavy programme of work including Chemistry, Biochemistry, Physical Chemistry, Zoology, Bacteriology. Crop or Agronomy specialists will need Genetics, Chemistry, Biochemistry, Botany, etc.

It will be seen, therefore, that the sciences are absolutely fundamental for any of the so-called practical branches of agriculture, and when we turn to the sciences we shall find that it is now necessary for even specialists to have a wide knowledge of more than one science because of the interlocking of subjects; special problems often involving a thorough knowledge of Biochemistry, Physical Chemistry, Botany, Bacteriology, etc.

The Demand for Well Trained Men.—Our Agricultural Colleges or Faculties of Agriculture of Universities, and Government departments needing scientific help are looking for well trained men, men who have not only their B.S.A. degree, or its equivalent, but who have something further. Teachers are required who understand how to teach. Research men are needed who can conduct independently original research.

At the recent Universities' Conference held in Winnipeg, great attention was given by the Conference to the problem of their research men, and it was thought that all our universities should do what they can to train Canadian students. Certain universities have recently established graduate faculties, and it was voted by the Conference that the subject of the greatest importance for the next discussion was to be the subject of graduate work. Several Deans of Agricultural Faculties deplored the lack of trained men and stated that they had to go to the other side to find them. The Dominion Government recently wanted men in certain lines for expert work, but could not find them in Canada with sufficient training. Hence, it seems that not only must Canadian colleges do something to supply this demand, but we must also induce more B.S.A.'s to take up graduate work. A start has been made in some institutions. The Faculty of Agriculture of the University of Saskatchewan has granted several scholarships and has placed on its curriculum a number of graduate courses.

Recently, McGill University re-organized its Graduate Faculty, and due attention has been given to a number of agricultural subjects in this Faculty. The degrees offered are those of M.S.A., M.Sc., and Ph.D., and graduate students can specialize in Agronomy, Bacteriology, Chemistry, Entomology, Plant Pathology, and Poultry, and it will be possible for students to use both the resources of McGill University and those of Macdonald College.

At Macdonald we are well equipped for graduate work. There are twelve men on the staff with advanced degrees, nine of them with their Doctor's degree. There are excellent laboratories and there is good accommodation generally. The situation of Montreal as the export centre of Canada gives many facilities for those who desire to study marketing. Both French and English languages are spoken, permitting students to acquire a knowledge of a second language with little difficulty. Good individual attention can be given to students, and it is hoped that this Canadian effort will be appreciated by those desiring to take up post-graduate work.

DR. L. S. KLINCK, PAST-PRESIDENT, CANADIAN SOCIETY OF TECHNICAL AGRICULTURISTS: PRESIDENT, UNIVERSITY OF BRITISH COLUMBIA

Of the many issues which have engaged the attention of the Canadian Society of Technical Agriculturists since its organization two years ago, that of agricultural education has come to occupy a foremost position. Each convention has seen this question emerge more clearly and gradually assume more definite form.

This statement is particularly true in regard to advanced agricultural education. The need for post-graduate courses is becoming more generally recognized and the demand for their establishment is growing more insistent. Technical agriculturists have come to realize the necessity for raising the status of their profession, and are of opinion that the best way to do this is to see that ample and varied post-graduate courses are provided in one of the Canadian agricultural colleges.

Favourable consideration of this question by the administrative heads in our colleges of agriculture was urged, at the last convention, by the older graduates even more strongly than by those of more recent standing. The fact that many of the earlier graduates had not taken advanced degrees, detracted in no way from the effectiveness of their advocacy of post-graduate courses, but constituted an indirect proof of their sincerity and of their integrity of purpose. Twenty years ago, personal or professional pride might have rendered it very difficult for some of the graduates of that time to make as strong a presentation of the case for advanced study as they made when the Report of the Committee on Agricultural

Education was under discussion. That post-graduate courses in agriculture were not offered in Canada at the time these men obtained their Bachelor degrees, only strengthened their determination to see that the younger men in the profession should be given every opportunity and facility to proceed to advanced work in one of our own agricultural colleges.

The expression of this conviction was not confined to a few individuals or to one or two groups. Representatives of every department of agricultural endeavour —farmers, administrators, professors, investigators, recent graduates, and undergraduates—were practically unanimous in declaring that the time had come for the immediate expansion of this neglected phase of our educational policy. As a result of this attitude on the part of the delegates, a strong committee was appointed to collect and compile data for presentation to the next convention with a view to facilitating the initiation of a more comprehensive and better co-ordinated system of post-graduate courses in the Dominion.

Never before in the history of agricultural education in this country has such an opportunity presented itself to the older colleges in Eastern Canada. Their position is an enviable one. The college which first comes within measurable distance of attaining unto the possibilities which this unique situation presents, will place itself in the vanguard of agricultural education in Canada; will permanently enhance its prestige; and will ensure its unchallenged leadership in this field of education for many years to come.

But such an opportunity cannot reasonably be expected to present itself much longer. The need is urgent; the demand is insistent; and, unless the older institutions avail themselves of the advantages the occasion affords, the younger colleges will be forced to extend the scope of the graduate instruction they are now giving.

The younger agricultural colleges in Canada are looking to the older ones to do for agricultural education what they, as more recently organized institutions, cannot do at present for themselves, viz., provide post-graduate courses to meet the needs of all students who may wish to proceed beyond the B.S.A. degree. Macdonald College has made a commendable beginning in this direction, but as yet she has not attracted many graduates other than her own, nor has she instituted advanced courses in subjects other than in the pure sciences.

Canada's population is too small and too widely scattered to justify the establishment of more than one fully staffed and equipped graduate school in agriculture. But such a school we must have, unless our more ambitious graduates are to continue to go the United States for post-graduate work, with the result that, in many cases, they are lost to us. Fortunately their going is not an unmixed evil, since all those who return are even more convinced than before of the necessity for expanding and enriching the curricula of our colleges, and for educating administrators and the public to the educational advantages and patriotic duty of adopting a more progressive policy.

The Dominion Government can influence educational policies only through federal grants. Unfortunately federal grants rarely stimulate provincial generosity, unless a proportional contribution is agreed upon. Since, however, the Dominion Department of Agriculture is largely dependent upon the agricultural colleges for the personnel of its technical staff, this Department might consider favourably the giving of financial support to one of the colleges for the purpose of assisting in the development of post-graduate courses.

The situation, as the writer sees it, is that one institution, properly staffed and equipped, would meet immediate requirements. Thus far the only agricultural college which has developed post-graduate work to any considerable extent is a privately endowed one. Unfortunately, jealousy among colleges is not unknown.

even when their appropriations come from different sources. It is conceivable then, that occasions for misunderstanding, and possibly for friction, might arise if one State supported institution were granted federal assistance and the others were not so favoured. This difficulty might be overcome, in a measure at least, were the Dominion Government to give assistance for this purpose only to Macdonald College.

It is immaterial in itself whether the institution which elects to undertake this task is state-supported, or privately endowed. The important consideration is that post-graduate work, on a scale commensurate with the needs and requirements of Canadian agriculture, be instituted without delay.

Some effective means must be found to provide advanced training in Canada for every agricultural graduate who is desirous of proceeding to an M.S.A., or a Ph.D. degree. Some means also must be found by which men, who are now occupying teaching or administrative position, may be given an opportunity to take advanced courses in their special subjects. The adoption of such a policy would be as much in the interests of the departments of agriculture, of the colleges, and of private or co-operative organizations, as it would be in the interests of the technical agriculturists themselves.

The adoption of the sabbatical year; the granting of leave of absence to teachers and investigators who may wish to take advanced courses; the institution of bursaries, scholarships and teaching fellowships, and more liberal remuneration for thoroughly trained men, have long been recognized as part of the settled policy of many institutions in other branches of higher education. In view of these facts one might fairly ask if there is any valid reason why the recognition of these principles should not be extended to include professors, investigators and other professional men engaged in agriculture.

In each province the responsibility for formulating and giving effect to the undergraduate courses rests with the authorities in the local institution. The same is true in regard to post-graduate courses. There is, however, a growing concensus of opinion that the time has come for agriculturists in Canada to think nationally, rather than provincially, on all matters pertaining to the wider interests of the profession. Of these wider interests, that of providing adequate post-graduate facilities is by no means the least. The leaders in agricultural thought are looking to the agricultural colleges for creative suggestions which will make possible national thinking and national action on this fundamental question.

J. B. REYNOLDS, M. A., PRESIDENT, ONTARIO AGRICULTURAL COLLEGE

All Canadian Agricultural Colleges are beginning to emphasize the necessity for graduate studies by members of the Teaching and Research Staff. This practice has become so general with all institutions of higher learning, that is, institutions above school grade, that any such institution which does not encourage or require graduate work of its staff, necessarily falls into a lower grade of institution. Especially is that true with respect to the B.S.A. degree as given at Guelph. It is a good course as a foundation but there is not sufficient specialization in it to justify a graduate calling himself a specialist until he has taken further work and preferably elsewhere. I have no particular sympathy with the craze for degrees which seems to prevail in some of the American institutions, as well as some Canadian institutions, but it is obvious that specialist standing in college work should not be granted to an instructor whose training has been for the most part general.

This college has intimated these views to the members of the staff, especially of course the junior members, and is making generous provision for any member of

the staff to follow graduate studies. It has been further intimated that graduates who join the staff with no more than the B.S.A. training need not expect promotion until some graduate work has been taken.

I am not at present prepared to say how facilities for graduate work in agriculture may be provided in Canada. I am sure that a good deal of it can be provided by the universities. The graduate work in the sciences resolves itself into a few important subjects like Biochemistry, Plant Pathology, Genetics, and Economics. The universities are provided with the men and equipment necessary to furnish graduate work in these subjects. Perhaps the more technical branches of Agriculture and Animal Husbandry may be ultimately provided at Ottawa. So far as this institution is concerned, much as we wish to encourage graduate studies and as much as we should like to offer some branches of graduate work here, we are at present too fully occupied with under-graduate work to consider this kind of extension.

JOHN BRACKEN, B. S. A., EX-PRESIDENT, MANITOBA AGRICULTURAL COLLEGE

The time has arrived, in my opinion, when facilities comparable with those offered elsewhere should be provided in Canada available to agricultural graduates who desire to equip themselves for research work in its more advanced forms. Agricultural Colleges in this country have not set themselves as yet to train men for research work of a high type. They have been concerned chiefly in turning out practical agriculturists and demonstrators in accordance with the prevailing demand. With the development of the country, however, a demand is arising for highly trained technical men to carry on various forms of research in connection with the more obscure problems which from time to time present themselves. Work of a purely scientific nature demands a high degree of specialization, and the usual graduate course must be regarded as affording merely the foundation for specialized work of the research type.

When positions calling for advanced qualifications occur—and they are beginning to occur with much more frequency than heretofore—men with the necessary training are not usually available in Canada, and have to be sought for in other countries. Those of our men who are qualified will be found to have taken post-graduate work elsewhere. We should not have to send our men outside of Canada for the necessary advanced training, nor should we have to import men either from the United States or some other country to do this type of work.

E. A. HOWES, B. S. A., DEAN, FACULTY OF AGRICULTURE, UNIVERSITY OF ALBERTA

The interest in graduate work in agriculture has increased very materially within the past three years. Several reasons are given but the most logical one would appear to be that of the impetus given to research work during the war, not only in destructive agencies but in productive agencies as well. The history of agriculture shows that this was the experience following other wars but for reasons that are obvious the impetus was not quite so marked, at least as far as we have record. Whatever the reason may be it is quite evident that in Canada we have reached a point where we can not long afford to neglect the question of advanced training for our young men who elect to follow the work which we have termed professional. One would indeed be blind or have wilfully shut his eyes if he did not see in the trend of discussion at the last meeting of the C. S. T. A. at Macdonald College the recognition of the fact that agricultural education in Canada must be put on a higher plane, and that for professional work the B. S. A. is but

the first step rather than the last step in the training necessary to meet requirements.

At the University conference held at Winnipeg a few weeks ago the writer had the privilege of giving a paper on research work in agriculture. In that paper he submitted three statements for serious consideration.

(*a*) We need trained men for research work that is pressing upon us to-day and these trained men are very difficult to get.

(*b*) With a few exceptions most of our young men take their graduate work in agriculture outside of Canada, because we cannot train specialists until we have teachers who are themselves trained.

(*c*) This is scarcely a condition, rather an admonition, that it will indeed be detrimental to the work if any of our institutions attempt to stage graduate work before they have equipment, in other words, if they try to do so with existing material.

It would appear that in the very near future, as far as professional work is concerned, the B.S.A. degree will be looked upon as simply the foundation credit in training for teaching and research, just as the B.A. degree is now regarded by so many young people as only a foundation for their professional career. We cannot ignore this fact much longer, especially as heads of agricultural colleges even now are professedly looking for men of higher training than B.S.A. This statement need not necessarily be taken as minimizing the credit or standing of men who are doing work in teaching and administration in Canada to-day, and who aside from honorary degrees, can write but B.S.A. after their names. These men have taken graduate work in the College of Experience, but it is doubtful if any of them will prescribe this course for their boys, if a properly constituted scheme of graduate training is available academically. In other words they may as well frankly accomplish their orientation to date and take a certain amount of satisfaction out of the recognition given them because of their graduate course in the said College of Experience. Let us be good old sports in the matter, and take comfort also from the fact that we are the last of a vanishing class, and are entitled to this much distinction at least.

In conclusion, mention may be made of the location of graduate work. The idea has been advanced by some thoughtful men that a single institution might do all the graduate work for Canada. Such an arrangement would have obvious advantages, but the writer doubts if it is practicable. Leaving out the fact of institutional autonomy as a more or less recognized condition, there remains the more difficult condition in the fact that boys who reach graduate work will themselves decide as to what institution they wish to attend, nor can the under-graduate instructors exert more than a partial influence in shaping their plans. This is caused by the fact that each college is strongest in some one or two departments and has achieved a name for teaching and research work in connection with these departments, and the boy will want to go where his specialty is being best advanced. It is manifestly impossible for a single institution to be outstanding in every department and therein lies the great difficulty with a centralized graduate college. There is also one other consideration and that is that every institution covets a quota of highly trained men, if it were only for the added dignity and tone given to the institution, not to speak of the inspiration derived from their presence in faculty. These arguments are submitted because the scheme to the writer appears rather an idealistic one, and therefore desirable; but appears from causes shown to be rather impracticable. In any case let our colleges, as soon as time and means will permit, secure trained men to handle graduate courses and let the student go to that institution which has best developed facilities for the particular branch in which he

wishes to specialize—better, too, that he go to an institution other than that from which he secured his undergraduate training—but above all let us see that the training is available in Canada.

W. J. RUTHERFORD, B. S. A., DEAN FACULTY OF AGRICULTURE, UNIVERSITY OF SASKATCHEWAN

THE need for agricultural research in Canada has been carefully pointed out on many occasions in recent years. It matters not what phase of agricultural effort one considers, the need for research is apparent. The soil and its effects upon plants and animals and upon the products of each is not at all well understood and presents many problems to the farmer, who must rely upon the well trained scientist for their solution. Field and orchard crops are in great need of revision. New crops must be found for many sections of Canada, and plant diseases and insect pests must be combatted. The animal industry craves for scientifically trained men to make it secure in our agricultural economy—feeds and feeding, management, breeding, preventing contagious and infectious diseases, and providing for live stock of various sorts an escape from the baneful effects of insect pests. Farm implements and machinery, farm buildings and, not least, the business management of the farm itself—including the selection of enterprises, the laying out of the fields, the selection and management of soils, crops and animals, equipment and labour, and the marketing of farm products—afford ample scope for improvement through research and investigation.

Every educational institution in Canada having to do with agricultural teaching or research is in quest of more highly trained men. An inviting field lies open to the graduates of Canadian institutions who equip themselves to attack problems of various kinds that are now confronting Canadian agriculture. Provision has been made at the University of Saskatchewan for giving courses leading to the Master's degree, with majors in the various departments of Soils, Field Husbandry, Animal Husbandry, including poultry and dairying, and Agricultural Engineering, and minors in Biology, Chemistry, Physics, and Economics. An annual scholarship of $800 has been provided to enable a promising student each year to study abroad for at least two years, depending upon the progress made. During the academic year 1921-22, four graduates in agriculture from this institution were pursuing post graduate studies in American universities and five here. This year four are away and seven at home.

PART I

Dominion Department of Agriculture

DOMINION EXPERIMENTAL FARM SERIES

THE CAP ROUGE EXPERIMENTAL STATION

BY GUS. LANGELIER, SUPERINTENDENT

THE Cap Rouge Experimental Station was established in January, 1911, to help solve some of the problems of the farmers, breeders and horticulturists of Central Quebec. It is situated on a good macadam road, some eight miles west of the city of Quebec, and comprises 425 arpents or about 350 acres, two-thirds of the area being under cultivation.

Everything done at Cap Rouge converges towards experimental work. This work is divided into three main branches: agriculture, live stock, horticulture.

Agriculture

The work pertaining to agriculture comprises soil and crop management, soil fertilization, and the testing and breeding of forage plants and cereals.

Soils and Fertilizers.—One of the important projects in soil management is a comparison of summer, autumn and spring ploughing for silage corn. The season is short in Central Quebec and when there is a lot of spring ploughing to be done, some of the other work is liable to be delayed. A few more years will give interesting data in regards to this question.

The part played by tilth, also by organisms will, with time, receive attention, whilst farm manures, green manures, chemical fertilizers, and lime have been looked into to some extent. One of the main projects in this connection is a comparison of burnt lime with ground limestone. This is an important one anywhere, and especially so in a district that is the oldest one in cultivation in Canada.

Crop Management.—The following projects are receiving, or have received, careful attention: cost of production of field crops; comparison of different rotations; planting corn for silage in drills or in hills; rates of seeding oats; comparison of corn, sunflowers, peas and oats for silage; rates of seeding timothy and red clover; yield of clover hay after different rates of sowing oats, and also after different kinds of nurse crops. A very interesting study is made of the cost per ton of digestible nutrients in timothy and clover hay compared with corn silage and with swede turnips. The results of ten years of careful work on a very large scale—all cost items having been recorded and all crops weighed on over 500 acres—show that succulence plays an important role. It should not be overlooked, however, that it costs from two to three times more for a ton of digestible nutrients in corn silage and swede turnips than it does in hay.

Forage plants and cereals.—Hundreds of varieties and strains of grasses, clovers, corn, roots, wheat, barley, oats, peas have been tested and a large number discarded because they were practically identical with existing varieties, or they were not adapted to the conditions of the district. A certain number have been found to be leaders in their respective classes, such as Longfellow corn for silage, Quebec Yellow corn for grain, Good Luck swedes, Huron wheat, Manchurian barley, Banner oats, Arthur

peas. In every case, an attempt has been made to select strains of each of these varieties which would do especially well in the district, and good success has been obtained, especially with Huron wheat and Manchurian barley, as the Cap Rouge selections have outyielded not only the parent varieties but also every variety of the same kind of grain that was tried at the Station.

Live Stock

Live stock is mentioned after agriculture proper as every farmer should concern himself with producing good crops before undertaking to improve live stock.

Trial Plots at Experimental Station, Cap Rouge, Que.

Of course, if the two things are done at the same time, so much the better, but it is a great mistake to try and improve live stock on a neglected farm where crop yields are poor. At the Station, work with live stock is now confined to horses, cattle and poultry, and experiments are conducted, or have been conducted, in the breeding, feeding, housing, and management of each class of the above named.

Horses.—The Superintendent of the Cap Rouge Station is also superintendent of the largest horse farm east of Manitoba. This farm is situated at St. Joachim, on an electric car line, twenty-five miles east of Quebec city. French-Canadian horses are used for experimental purposes, but also with the avowed object of rejuvenating this best of all general purpose breeds. Some ninety head are kept at present and over thirty mares, all registered, are due to foal in 1923. Different methods of breeding—close, in line, or outcrossing—now constitute the main project, though experiments relating to feeding, housing and management have received attention. All these horses, including weanlings, with the exception of the few mares kept for work, are wintered in open-front, single-boarded sheds, and there is no sounder or hardier bunch to be seen anywhere.

Cattle.—The herd of French Canadian cattle at Cap Rouge, numbering about sixty head, is acknowledged to be the best in existence, from the point of view of production. The two-year, three-year and four-year-old champions in Record of Performance are all in the same stable, and it is the exception rather than the rule, for a heifer to fail to qualify for Record of Performance with her first calf. In breeding up this herd, the main lessons learned were that

it is no use to try and do anything if the stock is not kept perfectly healthy, and that the use of bulls out of heavy producers is absolutely necessary to increase the average milk yield of a herd. Amongst the projects receiving attention are a comparison of whole milk with skim milk and substitutes for raising calves; the food requirements to rear heifers until of milking age; heavy versus light grain feeding for winter production; wintering stock in single-boarded open-front sheds; extra good versus poor rearing of heifers as influencing the type and production of the mature cow.

bird was used if not out of a hen with a yearly production of at least 150 eggs, but the minimum requirement is now 200 eggs. This pedigree work is interesting not only from the point of view of trying to breed up the Cap Rouge flock of Barred Rocks, but also from the general point of view of genetics. Amongst the feeding projects, all for winter egg production, which received attention for five years, are a comparison of commercial grain with screenings; roots with clover; skim milk with beef scraps; water with snow. A comparison is now being made between commercial and home-grown feeds. An investigation

A large number of varieties of fruits, vegetables and ornamental plants are tested at the Cap Rouge, Que., Experimental Station.

Poultry.—A flock of about 300 Barred Rocks is kept during winter, and about 750 chicks are hatched annually. As it has been proven by a careful experiment of five years' duration that early pullets are the most economical winter layers, only 100 hens are kept over, while 200 pullets are added each year. With the aid of trap nests, wire-covered trays in the incubators and sealed wing bands, pedigree breeding is conducted so that any bird's ancestry can be traced at any time. When starting this work four years ago no male

was made as to the fluctuations of temperature in houses of different widths, from the colony house, 8 feet wide, to the permanent structure of 16 feet, and it was found that it is more stable in the latter.

Horticulture

A great deal has been done with fruits, vegetables, and flowers as there are a very large number of people interested in these in a district such as this, where there are two fair sized cities and a number of smaller industrial centres,

and the production of fruits, vegetables and flowers is an important industry. For this reason much attention has been given to horticulture. The main phases of the work have been testing and breeding varieties and strains and cultural experiments.

In connection with fruit, attention is given chiefly to apples, plums, strawberries, raspberries, currants and gooseberries, but there are also projects relating to cherries, pears, and grapes. Over 200 varieties and strains of fruits have been and are being carefully tested, with the result that the following may be recommended for the district: apples, Yellow Transparent, Duchess, Wealthy, from summer to mid-winter; black currants, Climax; gooseberries, Silvia; strawberries, early Excelsior, mid-season, Dunlap; raspberries, early, King, mid-season, Herbert. A few selections and seedlings, especially of black currants and strawberries, are very promising. Amongst the important projects with fruits may be mentioned a comparison of different cover crops for apple orchards, also the cost of establishing an orchard of McIntosh apples with Wealthy as fillers.

Practically every vegetable of any importance to the district has received attention, such as asparagus, beans, beets, cabbage, cauliflower, celery, corn, cucumber, muskmelons, onions, parsnips, peas, potatoes, pumpkins, rhubarb, squash, tomatoes, turnips, watermelons. An idea may be had of the scale on which variety testing has been conducted from the fact that of one kind of vegetable only, the tomato, seventy-six strains or varieties were tried. Plant breeding has been very successful, especially with asparagus, beans, beets, cabbage, corn, parsnips, peas, potatoes and tomatoes. Cultural experiments were made with thirteen of the above named vegetables, and some of these projects are still going on.

Over 600 varieties of trees, shrubs, perennials, annuals, and bulbs have been tested, and many have been eliminated because they were not hardy enough or not as attractive as others of the same size and season.

THE MEAT AND CANNED FOODS INSPECTION SERVICE

BY ROBERT BARNES, V. S., Chief MEAT AND CANNED FOODS DIVISION

PUBLIC health demands purity of food products, and the procurement and maintenance of a wholesome and hygienic food supply is unquestionably one of the most important subjects with which the sanitarian has to deal. Disraeli once remarked that the happiness of a nation depended upon the health of the people. The statement is as significant to-day as it ever was. One of the most encouraging present day developments is the awakening of the health conscience, so to speak. But no matter how alert, well informed and prudent the individual may be, he is no longer able to protect unassisted his own health or that of his family from some of the most serious dangers that threaten it through eating food of an unwholesome nature, and it is only by the aid of the strong arm of the law acting through public officers concerned in matters of this nature that he is protected.

The knowledge authentically established that many of the animal diseases are communicable to man compels us to recognize the urgent demand for the eradication of disease among domestic animals, and the safeguarding of public health by insisting on meat that is sound, wholesome and absolutely free from disease.

The traditions of the oldest civilized nations show regulations governing the inspection of foods. That such is the case is evident from the history of the Egyptians, the Israelites, Phoenicians, Babylonians, and Athenians; and we are credibly informed that in Alexander the Great's time rather drastic measures were adopted in an endeavour to protect the consumer.

Meat and Canned Foods Act

In Canada, so far as Federal legislation is concerned, such measures are comparatively new, being in existence but 15 years, or since 1907, when *The Meat and Canned Foods Act* was placed on the statute book. This Act is probably as far-reaching and as authoritative as any at present in force.

The Act and the regulations thereunder provide at the present time for the inspection and certification of all meat and meat food products, canned and preserved fruit, vegetables, fish, and milk condensed, evaporated or otherwise preserved for food, and for the supervision of all establishments engaged in the preparation of such products. The division of the Health of Animals Branch of the Dominion Department of Agriculture having charge of the work is known as the Meat and Canned Foods Division. Federal authority appears to be limited however by the Act of Confederation to the examination and control of such products only as are destined for export or for interprovincial trade. When an establishment is placed under inspection, the officers of the Department take entire control as far as all food products handled are concerned, both as regards examination for wholesomeness, sanitary handling during the course of preparation, and proper labelling of the finished product.

Meat Inspection

As a result of fifteen years work in connection with the phase of inspection relating to meat, many conditions and diseases which entail an enormous loss to the country have been discovered. Probably ninety-five per cent of the diseases and conditions for which condemnations are made in the public abattoirs are preventable.

On an analysis of 1,500 cases of tuberculosis in children, it was demonstrated that seventy-five per cent of gland tuberculosis is of bovine origin; sixty-six per cent of generalized tuberculosis is bovine; some eighteen to twenty-six per cent of deaths from tuberculosis are caused by the bovine bacillus. Bovine and human tuberculosis germs are separate and distinct organisms. The bovine organism can and does cause disease in the human being to an alarming extent. To the children especially it is a real menace. By wiping out the tuberculous cattle throughout the country the lives can be saved and the health impairment prevented of thousands of boys and girls.

When meats or meat food products have finally passed the course of inspection, they are marked with a circular stamp bearing the words "Canada Approved" and a crown in the centre, and also the number of the establishment. By this means a quarter of beef, no matter where found, can be identified by the number as having been slaughtered at a particular plant. Unless the meat placed upon the market bears this stamp, there can be no guarantee as to its wholesomeness or fitness for food.

Inspection of Fruits, Vegetables, Milk, etc.

In connection with the canning of fruits, vegetables, milk, etc., every phase of this work was carefully gone into, with the result that the Branch was confronted with the necessity of taking some definite action for the protection of purchasers of foods contained in packages where the contents was not visible until the container was opened. To this end standards of quality for canned fruits and vegetables were adopted, whereby the producer, manufacturer and consumer would be protected. It is be-

lieved that Canada was the first country to put into effect such advanced legislation. In this we were followed almost to the letter by the United States, where the largest packing corporation in the world has adopted our nomenclature and our standards.

To-day a number of canning firms are buying their raw material on a quality basis, and it is believed that the excellence of their products will result in greatly increased demand both for home consumption and for export. In order that the export markets may be obtained and held, no consignment of these products may leave Canada without supervision and certification by officers of The Meat and Canned Foods Division. All establishments engaged in an export trade are numbered, and the number must appear on the package. It is therefore quite easy, should complaints be received, to determine the factory responsible. In order that Canadian producers may not be subjected to unfair competition, it is required that imported products conform to Canadian standards.

A few years ago immense quantities of peas were imported from France which were small, tender, and of a beautiful colour. The colour was obtained by the addition of sulphate of copper. That trade is now a thing of the past, as goods rendered attractive by the addition of colouring material are barred from entry into Canada, while their manufacture in Canada is prohibited. Formerly dishonest methods were also rife in connection with the canning of tomatoes. The honest packer could not compete with those who would place in the can a few skins, seeds and water. To-day such products may not be manufactured nor imported.

The canning of foods, or the method by which foods may be preserved through the application of heat, is no secret; our grandmothers long ago learned the art. That art has been improved by the building of proper premises, and the introduction of mechanical equipment, etc., to the extent that the manufacturer can to-day produce and place on the market as good or better products for less money than can be produced in the household.

The number of canning factories at present operating in Canada is sufficient to take care of, during the season of plenty, vast quantities of foods, essential to our growth and development, for use at seasons of the year when fresh products are unobtainable or where conditions render them difficult to procure in the fresh state. Now that Government supervision is exercised over their preparation, canned goods may be purchased with the full assurance not only that they are wholesome but also that the goods contained in the package are of the class and quality represented.

THE MARKETING OF CANADIAN FRUIT AND VEGETABLES

Measures Adopted to Bring About Improved Conditions, and the Part Played by the Fruit Branch in Connection Therewith

BY G. E. MCINTOSH, COMMISSIONER

WHILE fruit growing was a well established industry in the older provinces of Canada 25 years ago, the trade, particularly for export, was in a most unsatisfactory state owing to lack of packing and grading regulations. At that time certain commercial standards were used which varied with the season and the individual judgment of the packer, and as a result all grade marks had become meaningless to the trade. Over-

facing was also a common practice. The returns from apple sales in Great Britain reflected the lack of confidence felt by buyers in Canadian packs.

Realizing that as production increased and distribution extended, standardization of packages and uniform grading regulations were necessary if the fruit industry was to be permanently successful, the Department encouraged this marketing necessity, and as a result *The Fruit Marks Act* was passed in 1901, the Bill being introduced by Senator E. D. Smith, a well known shipper of the Niagara district. The Act made it compulsory for all fruit packed in a closed package intended for sale to be marked with the name and address of the packer, the variety of fruit and the designation of grade, the grade mark used being optional with the packer. It also provided a penalty for overfacing.

The Fruit Marks Act has been amended from time to time to meet the growing needs of the industry, and the evolution of the Act is practically the history of standardization so far as the fruit industry of Canada is concerned. The Act now specifies all grade marks that may be used, defines the grades, contains regulations with respect to imported fruit, the filling of packages, and the sale of immature or decayed fruit. It also applies to open as well as closed packages, and provides standard packages for practically all kinds of fruit grown commercially in Canada. The specifications for these packages having been carefully worked out by growers, package manufacturers and representatives of the Fruit Branch. Previous to the standardization the multiplicity of packages in use created unfair competition as well as being deceptive to the consumer.

Immediately after the passing of the Act it became evident that some machinery would be provided for its enforcement. The Minister of Agriculture therefore organized the Fruit Division. With eight inspectors in the fall of 1901, the inspection service has developed at the request of the industry until, during the season of 1921-22, over sixty inspectors were employed, working almost entirely among the growers and packers, not only inspecting the fruit as it was packed, but also giving instructions in the best methods of picking, packing, grading and shipping. In 1901-02, 814 inspections were made, while in 1921-22 the staff inspected 21,473 shipments.

The first power spraying demonstrations in Eastern Canada were arranged by the Fruit Branch twenty years ago, and since then the Branch has co-operated with the provincial departments of agriculture in all educational work leading to improved orchard practice and to better methods of picking, packing, storing, and loading fruit.

Packing demonstrations with all kinds of fruit and all varieties of packages have been part of the work of the Branch since its inception. In 1904 the Department arranged for a western box-packer to introduce that method of packing in Eastern Canada. Such demonstrations have been continued from time to time until a fair proportion of the eastern crop is now being boxed, although the barrel continues to be the popular container in that territory.

Another factor in successful marketing is reliable information as to source of supply and market conditions. Owing to the perishable nature of fruits, it was recognized that crop estimates and market intelligence should be included in the activities of the Branch. In 1905 the distribution of a Monthly Crop Report was commenced, showing conditions in the commercial fruit districts, crop prospects and market values in Canada and competing countries. This bulletin also includes notes on transportation matters and other items affect-

ing directly or indirectly the marketing of fruits and vegetables.

Since 1914 a Telegraphic Market News Letter has been issued semi-weekly throughout the marketing season. This is published simultaneously at Middleton, N.S., Ottawa, Ont., Winnipeg, Man., and Vancouver, B.C. It contains prices telegraphed by members of the staff in the marketing centres from Halifax to Vancouver and, during the export season, the prices paid on the large markets of the United Kingdom as cabled direct by the Canadian Fruit Trade Commissioner in Liverpool; also the wholesale markets in several large centres of the United States.

The necessity for a special Fruit Trade Commissioner in Great Britain was urged by the Fruit Branch for many years. The appointment was made in 1916, and the result has been that Canadian exporters have secured unprejudiced criticism and valuable information as to the best method of meeting the market requirements of the United Kingdom and Europe.

To deal with the many complex problems arising in connection with both domestic and export transportation, a transportation division was added to the Branch in 1917, with the result that the co-operation of the carrying companies was secured in improving the service for the transportation of fruits and vegetables. There has been a gradual evolution of transportation facilities during the past few years which has made possible the distribution of the Canadian fruit crop from the producing centres to the most distant markets, thus in a measure keeping pace with the development of the industry. Special experiments have been made to determine the proper types of cars to be used under refrigeration, ventilation and heating; the proper method of loading cars, and the best method of handling in transportation the different kinds of fruits. Valuable information has been gathered and many improvements have been brought about by the co-operation between this division and the carriers.

With the improvement in grading, packing and marketing, due to the enforcement of *The Fruit Marks Act*, with the development of co-operative packing and marketing, which enables large lots of uniform quality, grade and variety to be placed on the market, and with the advancement made in transportation conditions, the commercial fruit industry in Canada is in good shape to face the period of general trade depression which is the result of reaction after the war years.

The Fruit Branch has encouraged the establishing of pre-cooling plants in producing districts for handling tender fruits. This together with the results of experiments in handling field fruit in refrigerator cars has made it possible to move safely British Columbia fruits of all kinds as far east as the Atlantic Coast, while Ontario berries, peaches and other soft fruits are being landed in perfect condition on the Prairie markets.

LEGISLATION

1901—*The Fruit Marks Act* passed requiring name and address of packer, the variety of the fruit and a grade mark to be placed on every closed package of fruit packed for sale, and that the face or shown surface be a fair representation of the contents of the package. Grade marks to designate the quality of the fruit were optional.

1902—Act amended providing grade marks No. 1 or "XXX" and No. 2 or "XX" and No. 3 or "X." The first quality only was defined.

1906—In the revised Statutes of Canada *The Fruit Marks Act*, together with other Acts relating to fruit and fruit packages, was codified as Part IX of *The Inspection and Sale Act*.

1907-8—The Act was amended limiting the grade marks that might be used to numerals, No. 1, No. 2 and No. 3. The No. 2 grade was defined. The use of a "Fancy" grade was also permitted, this grade requiring practically perfect fruit.

1913—An amendment was made covering the application of the Act to imported fruit, the kinds of fruit to which it was applicable to be prescribed by the Governor in Council.

1918—Amendments were made eliminating the Fancy grade, which had proved impracticable, and providing for a "Domestic" grade in addition to No. 1, No. 2 and No. 3. Provision was also made for the marking of open packages with the name and address of the packer, the proper marking of repacked fruit and of packages used a second time; it was also made an offence to pack immature fruit of certain specified kinds, and diseased fruit. A provision was also made requiring that fruit packages must be well and properly filled at shipping point. The regulation with respect to overfacing was also made more stringent and standard packages were prescribed for practically all fruits grown commercially in Canada.

1920—Further necessary amendments in connection with packages were adopted.

1922—In recognition of a widespread demand from the potato and onion industries for grading legislation, the Department arranged a conference of representatives of those industries to meet in Ottawa in February, 1920, to consider the advisability of providing Federal grades. Recommendations were made by the Conference with respect to the grading and marking of these products and the sale of vegetables by weight, and *The Roots Vegetables Act*, prepared in accordance with the wishes of that conference, was passed by Parliament in June, 1922. This legislation has been placed with the Fruit Branch for enforcement.

NOTES

In 1901 the Fruit Division was organized as a branch of the Commissioner of Agriculture, with W. A. McKinnon as Chief from 1901 until his resignation in July, 1904.

Alexander McNeill, Chief from July, 1904, until his death, December, 1913.

On May 1, 1913, the Division was raised to the status of a Branch, with Donald Johnson as Fruit Commissioner until his death in August, 1918.

From November, 1918, until his resignation June 1, 1922, C. W. Baxter was Fruit Commissioner.

Geo. E. McIntosh, Transportation Specialist of the Branch, was appointed Fruit Commissioner in August, 1922.

Dominion Fruit Conferences have been held under the auspices of the Department as follows:—

Second Dominion Fruit Conference, March 20-22, 1906, Ottawa.

Third Dominion Fruit Conference, Feb. 14-16, 1912, Ottawa.

Fourth Dominion Fruit Conference, Sept. 3-4-5, 1914, Grimsby.

Fifth Dominion Fruit Conference, Mar. 26-27, 1918, Ottawa.

Sixth Dominion Fruit Conference, Feb. 22-24, 1922, Ottawa.

PART II

Provincial Departments of Agriculture

THE AGRICULTURAL INSTRUCTION GRANT IN BRITISH COLUMBIA

Summary of Activities, 1913-1922

I. THE DEPARTMENT OF AGRICULTURE

THE allotments to the Province of British Columbia during the nine years, 1913-22, under the provisions of the Agricultural Instruction Act have been as follows:—

1914, Fiscal year ending	March	31	$ 47,334 76
1915	"	31	52,799 38
1916	"	31	58,265 94
1917	"	31	63,732 50
1918	"	31	69,199 06
1919	"	31	69,199 06
1920	"	31	69,199 06
1921	"	31	69,199 06
1922	"	31	69,199 06
Total			$568,127 88

From the above grants annual allowances have been made to the Department of Education *re* elementary agricultural instruction in schools, amounting to a total of $136,000 in the nine years.

The University of British Columbia at Vancouver has also received the following amounts:—

Year 1918-19	$ 8,000
" 1919-20	12,000
" 1920-21	20,000
" 1921-22	23,000
Total	$63,000

The sums available through the Act have enabled the Department of Agriculture to function to a much fuller extent than would have been possible if provincial appropriations only had been relied on. Valuable lines of education and demonstration work have been carried on to instruct the farmer how, by the adoption and application of correct principles, production from the land and quality of stock could be improved, thus giving a stimulus to agriculture.

The following is a summary of the chief lines of work taken up under the Act by the Department of Agriculture:—

Agricultural Journal and Publications Branch.—In March, 1916, the first number of *The Agricultural Journal* was issued, all Farmers' Institute members being placed on the mailing list.

The Journal, which is published monthly, has timely articles on fruit growing, stock raising, dairying, poultry work and other phases of farming. It also contains a record of Farmers' and Women's Institute work, and of the horticultural investigation and demonstration work carried on by the Department. Its aim is to help the farmer to secure better results by encouraging breeding from selection and correct methods of field and orchard practice.

Reports on Field Crop Competitions, Boys' and Girls' Clubs and several circulars dealing with activities of officials working under the Act have also been published.

Alfalfa Plots (1915-1917).—Twelve plots of one acre each were established at coast and interior points to demonstrate the suitability or not of this fodder crop. Very valuable data were gathered and considerably increased acreage in interior districts has followed the published reports of the Department.

Beekeeping (1914-1921).—Owing to the increase of foul-brood in certain districts in the province, seasonal inspectors were appointed from the year 1914 with locations in the Kootenay district, Okanagan and dry belt, Lower Mainland and Vancouver Island. Demonstration and instruction work was carried on coincident with inspection, and better and up-to-date methods of beekeeping were advocated.

In 1920, the number of inspectors was increased to 7; the outbreak of European foul-brood being alarming in the Lower Fraser Valley where four inspectors were allotted.

In 1921, 28 demonstration apiaries were established in various beekeeping sections of the province; whilst outdoor demonstrations, lantern lectures, judging honey at fall fairs, and the supervision of honey exhibits at coast exhibitions were also part of these inspectors' work.

Boys' and Girls' Clubs and Field Crop Competition (1915-1922).—In 1915, juvenile competitions were placed on an organized basis, and a bulletin was issued with cultural hints, rules and regulations. Instructors and judges were appointed, and the awards were based on three scores, field, harvested product and a financial statement. Prize-winning exhibits were made at seed fairs and the larger provincial fairs.

By 1917, the competitions organized in potato and corn growing, pig, poultry and calf rearing, were taken up by 20 clubs. This year (1922) 23 clubs have been formed, with a likely total of 30.

Cow-Testing Associations (1913-1922).—These associations were inaugurated in 1913, the first ones being at Chilliwack with 1,080 cows, Comox valley with 460 cows, and Langley-Surrey with 420 cows. The Department guaranteed the tester's salary.

The weighing of milk and the use of the Babcock test have resulted in the discarding of many unprofitable cows, whilst encouragement has been given to breeding from selection, balanced rations, proper housing, etc. There are now five active associations in the province.

Demonstration Dairy Farm Work (1913-1914).—Two veterinary surgeons were appointed specially to inspect dairy farms and advise owners on the production of pure milk.

Prizes were given for milk and cream competitions at fall fairs and awards made for the best equipped and conducted plants. Official tests of pure-bred herds were also conducted.

Dry Farming Demonstration Stations (1917-1921).—In 1917, two dry farming stations, established in 1913 by the Lands Department at Quilchena in the Nicola district and at 105 Mile House in Northern Lillooet, were taken over by this Department, current outlay being charged to the Grant. Extensive experimental work had been carried out by the Lands Department previously in connection with the growing of grains and grasses under dry land conditions. On taking over by this Department it was thought advisable to endeavour to make these farms more self-supporting by the production of live stock. Fodder crops were accordingly raised at both stations and flocks of sheep purchased, wool and lambs being sold. A number of horses were also bred and sold.

Various potato experiments were conducted at Quilchena, but, owing to adverse weather conditions, grain and fodder crops had to be cut for hay in several seasons. A very unsuccessful year was experienced at Quilchena in 1920 owing to the prevalence of grasshoppers, and the station was closed down in September, 1921.

At 105 Mile, various experiments were conducted with wheat, rye, oats and barley. The station not apparently serving any useful purpose was closed down in 1920.

Drainage Work.—In 1917, two ditching machines were purchased and operated to give instruction with regard to the value of drainage.

Pitt Meadows Demonstration Plot (1916-1921).—In 1916, a plot of ten acres was taken over in the Pitt Meadows district, an area under dykes, and tile drains were installed. The land was then manured and limed and divided up into plots during succeeding years. Experiments in oats, wheat, barley, corn, carrots, mangels, and potatoes were carried out. The resulting data are of value to farmers on an area of thousands of acres, which although protected by dykes, requires drainage and special rotation of crops.

Farm Demonstration Stations (1914-1917).—In 1914, six stations to demonstrate systems of cropping were located in the interior of the Province, land of poor average quality being chosen. An endeavour was made to restore the land to profitable production by methods within the reach of the average farmer; a committee of the local Farmers' Institute co-operated in an advisory capacity. These stations were increased to 12 in 1916, the six additional ones being located in Northern B.C., along the line of the Grand Trunk Pacific. Interesting records as to the suitability of certain varieties and of crop yields were obtained, although the closing of the northern stations after two years' work made definite data impossible.

The stations were reduced to 8 in 1917 and closed down at the end of that season.

Farmers' Institutes (1913-1914).—An elaborate series of two or three day short courses was arranged to include 95 Institutes; demonstrations in live stock and horticulture being a feature.

Field Crop Competitions (1912-1918).—These were commenced in 1912, when 14 Farmers' Institutes competed, the peak being reached in 1915, when 101 competitions were organized with 812 entrants. A bulletin of instructions and regulations was issued each year. The minimum size of plots was half an acre, and the awards were based on a field score. Considerable improvement in the potato and root crops of the Province resulted.

The year 1918 was the last for these competitions to be organized on a large scale with provision of instructors, judges and prize money. Judges are now supplied only on request to individual Institutes arranging for a competition.

Horticultural Demonstration Work (1913-1922).—One of the earliest activities under this section was the establishment of five-acre demonstration plots in Northern B.C., at Lawn Hill on Graham Island, at Bella Coola on the Mainland coast and at Terrace on the Skeena river. These were worked under the supervision of a horticulturist stationed at Prince Rupert. Important investigations in drainage, fertilizers and general crops, in addition to strictly horticultural work, were carried out during the years 1913 to 1917, when these plots were closed down owing to depletion of the staff from war duties. At Terrace, in particular, the work carried out in strawberry culture laid the foundation for an industry which began to produce on a car load scale in 1921.

In 1917, work was carried on at Hatzic in connection with the testing of varieties of strawberries on a commercial basis. Shipping tests were made and valuable information was given.

Fruit Packing Schools and Competitions (1913-1922).—Fruit Packing Schools have been held annually, competent instructors being engaged to supplement the regular staff. Especially good work has been done in outlying districts, such as the Kootenay, in instructing small growers who pack their own products. Prize money for competitions of pupils at fall fairs was also a feature for some years. In 1921, 8 schools were held with 99 pupils, and in 1922, 11 schools with 116 pupils.

Pruning Schools (1913-1922).—These have been an annual feature since the inception of the grant, every fruit growing district in the Province having received benefit from this important work. In this case also extra instructors are engaged where the horticultural staff could not handle the applications. Total Pruning Schools in 1921, 40; pupils, 441.

Experimental Work in Vegetable Growing and Greenhouse Work (1914-1917).—A ten-acre plot was operated at Summerland in the Okanagan valley during this period, cultural methods and varieties of early vegetables suitable for the Okanagan being demonstrated. In 1917, fifteen different crops of fruit and vegetables were grown, the gross return being $7,195.10 and expenses $2,237.85. This project was run as a demonstration by a farmer rather than as a government demonstration station. The example given of successful early culture of vegetables in particular has been largely followed at Summerland and in the adjacent districts of the Okanagan, and good markets have developed.

Strawberry Demonstration Work (1919-1922).—A demonstration strawberry plot was established on a six-acre lot at Gordon Head on Vancouver Island in 1919 in order to demonstrate the possibility of building up and improving an impoverished strawberry soil badly infested with the strawberry-root weevil. A six-year rotation was decided upon, the land put into shape and a weevil barrier built around one acre.

Cover Crop Demonstration (1919-1921).—Four plots of 2½ acres sown to winter vetch and sweet clover were operated in the West Kootenay and Okanagan districts to demonstrate to local fruitgrowers the value of nitrogenous annual cover-crops.

Anthracnose Control on Vancouver Island (1916-1920).—A series of experiments in experimental spraying for the control of the above disease on apple trees has been carried out near Victoria.

Apple Scab Experiments (1919-1920).—These were carried out in the West Kootenay and Salmon Arm districts.

Liming Experiments (1918-1920).—These were made at Salmon Arm.

Market Work (1915-1918).—With the object of assisting British Columbia producers to secure the best market for their produce and to supply information as to conditions, prices, grading, etc., a Coast Markets Commissioner was established at Vancouver. Weekly reports were sent to many hundreds of producers and the activities of the branch were responsible for the better marketing of much produce and the saving of considerable money to producers.

In 1917, this office undertook the inspection and issuing of certificates in connection with potato exports, good work being done in raising the standard of commercial shipments.

(The work of this branch was charged to Provincial funds from August, 1918.)

Noxious Weeds.—In 1915 *The Noxious Weeds Act* was revised and provision made for the employment of several seasonal inspectors. Good work was done of an educational nature

amongst the farming community on methods of control, and lists were compiled showing the prevalence of certain weeds in different districts, which were a basis for further control work.

Pathological and Entomological Work.—In 1916, laboratories at Vancouver and Vernon were established and equipped in connection with investigation and research work in plant diseases and pests. One, and later, two Assistant Plant Pathologists and Entomologists were appointed. Since 1917 a good deal of the time of the Vernon office has been taken up in connection with codling moth investigation work in conjunction with the local staff of the Dominion Entomological Branch and Provincial horticultural staff. Studies of the life history and control of the onion maggot and cabbage root maggot were also important lines in 1920-21.

Potato Work.—In 1917, late blight of potatoes was very prevalent in the Lower Fraser valley, and experiments were undertaken on four plots in the Cloverdale and Surrey districts. Spraying machines were bought and considerable work was done in drawing attention to the necessity of control methods for the improvement of crop yield. The work was carried on through the seasons of 1918-1921.

Poultry Work (1913-1922).—The improvement of poultry in outlying sections of the Province was aided by establishing poultry-breeding stations in 1913 to 1917, the Department supplying the stock, and the breeder guaranteeing to supply settings of eggs locally at a minimum price. Very good work was accomplished in developing good laying strains of strictly utility quality.

International Egg-Laying Contest.—This contest, open to the world, was the first to be held under official auspices on the American Continent. Forty pens competed with 6 pullets to a pen. Valuable data have been collected on rations, laying qualities and strains. Refunds from the sale of eggs make the contest self-supporting to a certain extent.

Seed Distribution.—A "better seed" campaign was organized in 1915, and the following seed distribution was made through farmers' organizations:

Oats	(2 varieties)	119,300 lbs.
Wheat		17,000 "
Corn	(3 varieties)	7,255 "
Mangel	(from Denmark)	2,240 "
Alfalfa	(2 varieties)	2,800 "

There were over 1,100 applicants for the alfalfa and corn alone. Valuable data were secured from reports at the close of the season.

The distribution was continued in 1916, the results in increased acreage and yield per acre being noteworthy.

Seed cleaning, etc.—In 1916, a clover and alfalfa huller was purchased and operated by the Department to encourage farmers to produce the highest quality of seed at home. The seed from over 200 acres was threshed the first year, a nominal price being charged for the service.

A Clipper Seed Cleaner was purchased and demonstrations given in 11 districts, between 50 and 60 tons of seed being cleaned.

Seed growers' directories have also been compiled.

Seed Fairs.—In 1916 seed fairs were held at Armstrong and New Westminster. Prizes were given by the Department, and all expenses in connection with transportation, etc., were paid. These fairs have become annual events.

Co-operative Variety Testing, 1916.—Wheat, Oats, Barley, Corn, Potatoes, Flax, Beet.—One thousand seven hundred and fifty-seven samples weighing

15,291 pounds were distributed. Reports as to quality, market, suitability and disease resistance, etc., were received and much valuable data accumulated.

Silo Demonstration Work.—This was commenced in 1914. Five silos were built and filled by the Department in districts were silos were unknown. A cheap but efficient type of stave silo was standardized and the farmers were encouraged to build same, blue prints and specifications being supplied. In 1916, it was estimated that 300 silos had been built by farmers as a direct result of this campaign and, by 1917, 500 silos had been built.

This work was continued to include the season of 1920, attention being given more to the construction of silos in Northern B.C. Afterwards demonstration fillings continued to be given in several districts. Sets of silo forms for cement silos were also purchased and loaned to farmers. By the close of 1920, 63 silos had been built by the Department and 51 filling demonstrations given by department-owned cutters and fillers.

Women's Institutes (1913-1914).—Competent lecturers in dressmaking and cooking visited all the Women's Institutes (25), the courses lasting two weeks. The demonstration work was highly appreciated.

SUPPLEMENTARY OFFICERS EMPLOYED UNDER THE PROVISIONS OF THE AGRICULTURAL INSTRUCTION ACT, YEARS 1913-1922

Position	1913 to 1914	1914 to 1915	1915 to 1916	1916 to 1917	1917 to 1918	1918 to 1919	1919 to 1920	1920 to 1921	1921 to 1922
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Assistant Horticulturists	5	2	4	3	1		1		
Assistant Plant Pathologist	1	1	1	1	1	1	1		
Assistant Soil and Crop Inspector	1		1	2	1	1			
Agriculturist	1	1	2	3	3	1	1		
Silo Demonstrator	1		1	1	1	1	1		
Veterinary Inspectors	2	2							
Secretary, Women's Institute Advisory Board	1	1		1	1				
Noxious Weed Inspectors			7						
Markets Commissioner				1	1				
Editor				1	1				
Foreman, Dry Farms					2	2	2	1	1
Cow Testers			7	5	7	4	7	5	5
Foul Brood Inspectors		3	3		3	3		6	4
Potato Inspector					1				
Poultryman	1	1	1	1	1	1	1	1	1
Assistant Entomologist						1	1	2	3
District Field Inspector						1	2		
Buttermakers								2	
Total	13	11	27	19	24	16	17	17	14
Total number of officers of Department paid from Provincial Votes	35	45	45	47	44	48	50	74	75

II. ELEMENTARY AGRICULTURAL EDUCATION

By J. W. Gibson, Director

IN the year 1913-14 approximately $1,000 was expended under the direction of the Advisory Board of Women's Institutes in co-operation with the Department of Education in introducing school gardens. During that year 17 institutes made application for school garden seeds and altogether about 40 schools established small flower or vegetable gardens, a promising beginning.

In 1914, a provincial director was appointed under the Department of Education and a scheme of work decided

upon which included (1) the holding of special summer courses for teachers in agriculture and related subjects; (2) the allowing of bonus grants to teachers undertaking agricultural instruction through school and home gardening, or other home projects in agriculture; (3) financial assistance to all school boards undertaking to carry out an approved scheme of agricutural instruction through school and home gardening; (4) the placing of agriculture as an optional subject in high schools, a two-year course, valid for matriculation credit to be established in such schools as could arrange to have the services of a qualified instructor; (5) the appointing of District Supervisors of Agricultural Instruction whose duties would include the teaching of agriculture in the public and high schools of their respective districts; exercising a general supervision over the teaching of nature study and elementary agriculture in those districts and helping the teachers to formulate and carry out such courses of instruction in those subjects as were best suited to the districts; conducting high school extension classes in agriculture during the winter months for the benefit of young men and women not attending high school; giving practical advice and assistance generally to the pupils out of school and to adult members of the community in all matters pertaining to local rural problems, including the organizing of agricultural clubs, school and community social functions, sports, etc.

The first District Supervisor was appointed in 1915, two others in 1916, three in 1917, and one or two each year following, until twelve men altogether were at work at the beginning of the present year. Students in 14 high schools to the number of about 450 were following the regular two-year course in agriculture, whilst public school pupils numbering approximately 10,000 in almost 100 schools, together with nearly 300 teachers, received regular assistance and instruction. Thus the District Supervisor system of British Columbia may be regarded as one of the important developments in rural education made possible through the beneficence of the Agricultural Instruction Act.

Administration

All District Supervisors are graduates in agriculture and in most cases also professionally trained teachers. Three of the men now engaged are also graduates in Arts. For the first two years when the number of District Supervisors was very small, their salaries were paid in full from Agricultural Instruction Act funds. Since that time, however, as the number of district men has increased, the province has been steadily meeting a larger proportion of salaries until, at the present time, only 50 per cent of the cost of salaries is charged against the Federal grant. Under the original plan, and until this year, the school districts interested met the cost of all maintenance expenses such as class-room accommodation, supplies and equipment, hired day labour and paid the travelling expenses of their respective District Supervisors. Some alteration of this plan has been rendered necessary for the present year whereby the various districts concerned are bearing a larger proportion of the entire cost of the work including 50 per cent of salary.

Instruction Educational rather than Vocational

The work as conducted under the District Supervisors, whilst primarily educational, has a certain vocational value. It is so presented that the students get the most practical kind of instruction working out, as they do through laboratory exercises, experimental plots at school, and carefully selected and supervised agricultural projects at home, the various phases of soil management, crop production and selection, horticulture, live stock, dairying, and poultry keeping. The text book brand of agriculture which has been tried from

time to time in Canada during the last three-quarters of a century and which has always failed and will continue to fail, finds no place in our British Columbia system. Exposition has always been the curse of agricultural teaching and more or less of all science teaching. Independent thinking and doing on the part of every student must be insisted upon, and this training in obtaining knowledge at first hand soon makes itself evident in connection with other subjects. The greatest value from this line of study therefore is the development of personality and initiative on the part of the student rather than the intrinsic value of the information gained, however useful that may be. The educational merits of this as of most subjects depends more upon the method of instruction followed than upon any particular quality or merit belonging to the subject matter itself. The two aspects of the question are very well expressed in Dr. Grisdale's report for 1918-19, page 11, "The chief value of school agriculture and related projects," he states, "lies in the opportunity presented for training the intelligence through facts vital to country life, and therefore all junior extension movements should be regarded as instruments in the accomplishment of this object." So much for the educational aspect of the study. The vocational bearing of the work is then set forth. "These activities" (agricultural projects and club work), he says, "do much to awaken in the minds of the young people who engage in them, an appreciation of the possibilities of agriculture, and to stimulate a greater enthusiasm for agriculture as a vocation." This suggests education *in* agriculture whilst the former suggests education *through* agriculture, quite different things and both excellent—each in its own domain—and complementary one with the other.

Summer Courses for Teachers

The funds provided through the Agricultural Instruction Act could not be more advantageously applied than in the providing of summer courses of instruction for teachers. Beginning in 1914, very thorough courses in elementary agriculture and nature study combined, under the name of rural science, were offered in 5-week courses. Teachers who completed two such courses—the preliminary and the advanced—were awarded diplomas as specially qualified teachers in that subject. Altogether 480 teachers have taken the preliminary course and 141 the advanced course. No summer school was held in 1916 and 1918. The salaries of the instructors giving the courses mentioned have been paid from year to year out of the federal grant. All teachers in connection with their Normal training course receive a limited amount of instruction in nature study and school gardening, good as far as it goes but entirely inadequate to meet the needs of the case, hence the added value of these supplementary summer courses.

Public School Work

Since the beginning of the work in 1913 a gradually increasing number of schools have instituted school gardens or school supervised home gardens. In 1913, as already stated, about 40 schools made small gardens, many of which did not prove successful chiefly on account of unplaced responsibility. Beginning in 1915, however, a standard of requirements was given out by the Department of Education which had the effect of stabilizing the work and giving to it more educational outlook. This meant considerable expense to school boards, hence the adoption of a scale of garden grants which were allowed to all school boards that complied with the regulations. Every year sees the inclusion of new gardens and also an occasional dropping of some of the older ones where results have not been wholly satisfactory on account of unfavourable conditions.

Last year 119 schools were officially reported as conducting standard school gardens, 194 teachers being engaged in

the work with 6,199 pupils enrolled in garden work. A school supervised home garden was conducted in 56 schools by 77 teachers with 721 pupils. Small bonus grants were allowed to these teachers in recognition of their efforts in conducting this special line of work, these grants ranging from $10 to $30 per year, according to the special qualifications of the teacher. These bonus grants as well as grants to school boards have been paid partly from Federal and partly from provincial funds.

Club Work and School Fairs

During the last few years the home-project work in gardening has gradually enlarged and now poultry, calf and pig raising are all making headway. An increasing number of teachers are yearly becoming interested in this line of school and home work, particularly in those districts where District Supervisors and Agricultural Representatives are located. All such clubs as are eligible are enrolled with the Department of Agriculture, which has official charge of that department of work. This club work is bound to increase, and with it the holding of school fairs, which are being organized with greater efficiency every year.

Total Expenditures on Agricultural Education from the Federal Grant

As shown by the detailed financial statements forwarded from year to year, the following amounts have been expended and accounted for:—

1913-14	$ 1,000
1914-15	15,000
1915-16	15,000
1916-17	15,000
1917-18	20,000
1918-19	20,000
1919-20	20,000
1920-21	20,000
1921-22	10,000
Total	$136,000

In conclusion I wish to say that the various lines of work herein referred to have been only too long delayed in British Columbia. But for the timely financial assistance provided through the Agricultural Instruction Act little of what has been accomplished could have been done. What has been done is but suggestive of much more that needs to be done if the rural interests and the best home life of the Province are to develop, and if happiness and prosperity is to be the lot of our future citizens.

III. UNIVERSITY OF BRITISH COLUMBIA

Faculty of Agriculture

THE University of British Columbia first participated in the Agricultural Instruction Grant in 1918. Since then the amounts allotted have been as follows;—1918-19, $8,000; 1919-20, $12,000; 1920-21, $20,000; 1921-22, $23,000; total $63,000. Of this amount $43,000 was not received by the University until the last fiscal year, and at its close on March 31, 1922, a considerable sum was still on hand.

The policy under the Agricultural Instruction Act has been first to accumulate data on which to base conclusions, and then by means of bulletins and extension schools to carry these conclusions to the farming communities. It was recognized at the outset that British Columbia agriculture was highly specialized, and that consequently it would be advisable to go into the various problems as deeply as possible. Tentative conclusions would lead us to believe that these assumptions were correct.

All work under the Agricultural Instruction Act is organized by projects; that is, the money is allotted for a certain work, rather than to certain men or departments. At the same time an effort has been made to encourage a major project in each of the five departments in the Faculty of Agriculture. The gen-

eral policy has been to collect data along certain lines as indicated below, and then to carry these to the people by means of extension schools in different parts of the Province. Insofar as possible, the extension men offer the instruction in the extension schools. This instruction is based on their investigations in the country and on the work of the departments at the University.

All publications under this Act have been published as Department of Agriculture bulletins. In this way an effort has been made to link up the work of the Faculty of Agriculture with the work of the Department of Agriculture for the Province.

Department of Agronomy

Fertilizer Project.—Under this project during the fiscal year 1920-21, 21 fertilizer experiments were laid out, 7 in the Interior and 14 in the Lower Mainland. During the year 1921-22, 22 experiments were conducted, 6 in the Interior and 16 in the Lower Mainland. Experiments in triplicate have been conducted on clays, sandy soils, alluvial, and cumulose soils. The following crops have been used; mangels, turnips, potatoes, small grains, tomatoes, alfalfa, and strawberries, and although it is too early to report definitely on results, figures thus far obtained indicate that considerable savings would be made were commercial fertilizers used more judiciously.

Clover and Grass Mixtures.—With the object in view of determining the population and the percentage of various grasses and clovers under different conditions, six clover and grass mixture experiments have been laid out so far on the Lower Mainland and in semi-arid localities. These are all located on crop producing areas; that is, no attempt has been made to solve range or grazing problems, in order to avoid any possible over-lapping of the work conducted by the Grazing Commissioner appointed by the Provincial Department of Agriculture. These mixtures include red clover, mammoth clover, alsike clover, white clover, orchard grass, tall oat-grass, meadow fescue, and perennial rye and timothy, and it is hoped that valuable information will be secured regarding these clovers and grasses in different combinations, so that it may be possible in the future to emphasize those particularly suited to certain localities.

Weeds.—Recently, as a project in the department of Agronomy, arrangements were made with the Department of Agriculture, Victoria, to undertake the re-writing and re-organization of Bulletin No. 18, "Noxious Weeds, their Identification and Eradication" This can be done only after a careful survey of the weed populations in the more important districts.

Department of Animal Husbandry

Cost of Milk Production.—Under this project an excellent beginning has been made. During the summer of 1920 the work was extended to fifty-four dairy farms. A careful report was made to each farmer and, in addition, Department of Agriculture Circular No. 36 (Faculty of Agriculture, University of British Columbia No. 1) was published and distributed to those interested. During the summer of 1921, the work was extended to one hundred and twenty-four dairy farms. An extension and revision of the first circular, based on the second summer's work has been issued as Department of Agriculture Bulletin No. 91, "Dairy Farm Survey."

Department of Dairying

Experiments are being undertaken by this department with the object of determining the "Period of Usability of Milk" produced for market purposes, consumption, and for butter and cheese manufacture. In other words, the policy is to secure data with re-

spect to milk produced in British Columbia, in order that the accumulation and interpretation of such data shall make possible (*a*) the offering of advice on the important question of milk spoilage, and (*b*) diminution in the extent of this spoilage.

The investigations would seem to indicate that sufficient data must be secured to lend a certain degree of finality to the conclusions; that milk of widely varied quality must be examined; that an endeavour must be made to determine the test or combination of tests which might most suitably be employed for the grading of market milk. The chief end of the investigation is, however, an accumulation of sufficient data of such a nature that conclusion based thereon may lend to the term "Possible Period of Usability of Milk" a definiteness that it does not now possess.

A specific investigation of an outbreak of ropy milk was conducted by the Extension Assistant under this project as well, a paper on which is in course of preparation.

Department of Horticulture

Survey of Fruit Industries.—The proposed work includes the collection of data from varieties; distribution and value in the various districts; yields of trees at various ages; costs of production, and methods of distribution and sale.

Under this head a certain amount of work has already been completed and published in Department of Agriculture Circular. No. 38. During the summer of 1921, the work was continued and extended to a larger number of varieties. Studies were made on one hundred and eighty-nine farms in the Okanagan Valley. (See Department of Agriculture Bulletin No. 90).

"Survey work on small fruit farms and a study of the cost of production of strawberries and raspberries." This work was started in the spring of 1921 and has been extended to include one hundred and twenty-nine farms on the Lower Mainland and on Vancouver Island. A considerable amount of data has been collected and the work is being continued during the summer of 1922. (For full report see Department of Agriculture Circular No. 39).

Department of Poultry Husbandry

The project undertaken by the department of Poultry Husbandry includes a survey of poultry farms and the poultry industry in order to study poultry farm conditions, costs of production, systems of housing, feeding, and such problems as may present themselves.

To date complete reports have been made on seventy-five farms and partial reports on about seventy-five others. A beginning has been made in the analysis of the report.

In addition to the above, the co-operation of thirty poultry farmers has been secured for the purpose of keeping complete records of incubation and brooding results. Also, the co-operation of ten poultrymen has been secured in keeping cost accounting records on incubation, breeding, rearing, and egg production.

Extension Schools

During the past four years Extension Schools of four days' duration have been conducted in the places indicated below:—

1918-19—Courtenay, Armstrong, Nakusp, Creston. Total registration 196.
1919-20—Grand Forks, Gordon Head, Haney, Cloverdale, Mission and Hat-

zic, Cranbrook, Nelson, Celista, Kamloops. Total registration 570.

1920-21—Duncan, Courtenay, Maple Ridge, Malakwa, Murrayville. Total registration 175.

1921-22—Barriere, Nakusp, Invermere, Pitt Meadow, Pemberton Meadows, Vanderhoof, Telkwa, Terrace, Total registration 732.

An effort has been made in these schools to lay special emphasis on fundamentals as well as on details, and it is felt that the courses have in every instance been attended with a large measure of success.

RÉSUMÉ OF AGRICULTURAL INSTRUCTION WORK IN PRINCE EDWARD ISLAND, 1913-1922

BY W. J. REID, B.S.A., DIRECTOR

IN the nine years during which the Agricultural Instruction Act has been in effect the province of Prince Edward Island has received from this source the sum of $279,220.64. This makes an average of slightly less than $30,000 per annum, and is the amount due on the basis of distribution adopted in connection with the Act. This grant has been carefully expended in Prince Edward Island for the furtherance of agricultural education and practical demonstration work. The results that have followed such work have been far-reaching in many respects.

In all departments the funds received from the Agricultural Instruction grant were devoted entirely to the work for which they were intended. A consideration of the various lines for which money has been apportioned will give an idea of the value of such work to the province.

Agricultural Buildings and Representatives

The province of Prince Edward Island is divided into three large counties, with a natural centre in each county, which has long been taken as the meeting point of the various agricultural interests. In 1913, a large centrally located building was purchased in each of two centres to be used as a meeting place for the farmers of the county, and also as an accommodation for seed fairs, short courses in agriculture and other activities. In 1915, a fully qualified agricultural graduate was placed in each county to devote his full time to the service of the farmers and the farming industry. This work was a source of much improvement until it became necessary to discontinue it owing to the pressure brought to bear on eligible men for the World War.

Short Courses

One of the earliest activities entered into under the Agricultural Instruction Act was the holding of agricultural short courses. These were conducted first at central points, and were followed by similar courses at local points throughout the province. The classes conducted at the central points were of two weeks' duration and had an attendance of from 250 to 500. The work was of a practical nature and in each case was responsible for the beginning of local co-operative activities. The courses at local points were of one week's duration, and the attendance was from 30 to 115. Practical lectures and demonstrations formed the basis of the work, to which could be added the social and community benefit of discussing matters of common interest.

To say that this work is a benefit is but a modest interpretation of its results. Many organizations of local and provincial value have been started, including co-operative lamb sales, co-

operative hog sales, co-operative shipping associations, pig clubs, calf clubs, egg circles, and others of a similar character.

Demonstration Work

Another important work, the inception of which is due to the Agricultural Instruction grant, is the promotion of under-drainage. This has been carried on since 1916. At that time an investigation of soils from several localities was conducted to locate material of a nature suitable for the manufacture of drain tile, which at that time was not being manufactured in the province. This was found in sufficient quantity in one place to warrant the establishing of a plant. The plant has been operated during the past two years under the direct supervision of the Provincial Department of Agriculture. From estimates made it can be stated that many thousands of acres in Prince Edward Island are in need of underdrainage. This work is being conducted at the discretion of the land owners, and in every case is finding a reliable advocate for its adoption in the one who has had the work done.

Investigations have also been conducted in locating limestone deposits for the use of those who are in need of ground limestone as an improver of soil conditions. This would apply more particularly to the western part of the province where a limestone deposit of some extent exists. At this deposit a limestone pulverizing plant has been installed, and has been in operation for two seasons. The outcome has been to secure recognition of the beneficial effects of limestone, especially when applied to acid soils.

Attention has been directed from time to time to the culture of particular crops for the benefit of those who are making a specialty in some particular line. Clover growing has perhaps received the most attention and, for the benefit of the growers of this crop, two hullers were purchased and placed at their disposal.

Rural Science

This department was established and is being conducted in connection with the Prince of Wales College for the purpose of interesting teachers-in-training in the development of club work and in consideration of other agricultural activities among the students of their prospective schools. The one in charge of the teaching is also responsible for the conducting of a number of school fairs throughout the province during each season. In 1915, three school fairs were held, while in 1922 there were fifty. Each year is showing an improvement, not only in numbers but in the interest manifested by teachers and pupils. The work is also responsible for the inauguration of such activities as poultry clubs and, in several instances, pig and calf clubs.

Women's Institutes

In the Women's Institutes of the province we have one of the most influential organizations for the educational and social betterment of the community. Their inception and maintenance is entirely due to grants apportioned from Agricultural Instruction funds. The first institute was organized in 1913; in 1922, 62 institutes were in existence. The original object in establishing Women's Institutes was for the giving of instruction relating to domestic economy and its various branches, but they have since developed into a valuable medium for rural organization and social up-building.

Agricultural and Technical School

The establishing of the Agricultural and Technical School was the outcome of the request of many young men throughout the province who were desirous of obtaining instruction in the elementary grades of academic work and in agricultural studies of a practical and partially scientific nature. The money for the development of this school was apportioned from the Agri-

cultural Instruction grant and from the Dominion grant for Technical Education. The first course was conducted in 1920 and met with an encouraging reception from all classes. The attendance has grown with each succeeding class until at the present time it is well over 75.

It will be obvious from this brief statement that the Agricultural Instruction grant has been an important factor in the life and maintenance of many agricultural activities in Prince Edward Island, with consequent benefit to the industry in general and to many of its branches in particular.

DAIRYING AT THE OKA AGRICULTURAL INSTITUTE, QUEBEC

BY REV. BR. ISIDORE, LECTURER IN ZOOTECHNY

AT first our herd consisted of grade cows, some with Ayrshire blood, others with Jersey or Canadian blood. At present, there are only pure-bred animals. After experimenting with the various breeds found in Canada, our choice finally settled on the following given in numerical order: Ayrshire, Canadian, Holstein.

Our purpose in keeping several breeds is entirely educational: to enable our students to learn *de visu* the respective value of these breeds, which, it should be stated, are also the breeds that appear to be the most suitable for the farmers of the province, according to whether the milk is sold for cheese making, or butter making or for direct consumption.

Of the three breeds above mentioned, the Ayrshires are in great majority, constituting three-quarters of the herd.

Why the Ayrshire has the Preference

The Ayrshire cow has many qualities appealing to all lovers of good cattle—symmetry of form, elegance of carriage, beautiful colour—which do not detract in any way from her producing capabilities, provided care is taken to develop her milking qualities along with her show qualities. This object is attained by selecting with a view to developing the following characteristics of conformation: good top line, as level as possible along the whole length of the back; a roomy chest, well developed on all sides, showing a strong constitution; a large and ample abdomen, showing great capacity of assimilation, and lastly, well developed milking organs and specially a symmetrical udder. A cow of this description does well at any show and is a profitable milker.

If one goes back to the origin of the Ayrshire one finds an explanation for these many excellent characteristics which are the attributes of the breed. The severe climate of the part of Scotland where the breed was improved gave it a hardiness uncommon among dairy cattle, and the crossbreeding done in the early history of the breed is responsible for many splendid and valuable qualities. The Ayrshire cow has a strong constitution and enjoys good health. She is a good eater, which is very important so far as production is concerned, and is not at all difficult to please as regards feed. She eats and makes good use of all the kinds of grasses that are found in the pasture. She might be called a "cosmopolitan" cow as she is readily acclimatized and thrives under different latitudes; and does as well in a hilly country as in a flat one. The Ayrshire is a very good cow for the ordinary farmer, as she requires little in the way of care and feed and brings a good profit, even when kept under rather unfavourable conditions. Another quality of the Ayrshire is her longevity. She is a good breeder, and breeds until an advanced age.

The milk of the Ayrshire may be used for all purposes, but it is specially valuable for direct consumption, being easy

to digest, chiefly on account of the small size of the flat globules, which facilitates absorption. It keeps well, as the cream, being made up of these small globules, does not rise so fast as in other milks; moreover, after a prolonged rest, these globules mix more readily and more completely with the serum of the milk, and this is an advantage in commercial milk. The flavour of this milk is due to a comparatively high percentage of fat. Physiology has taught us that milk testing more than 4.5 per cent of fat is difficult to digest, while milk containing less than 4 per cent of fat has not so good a flavour.

The French-Canadian Cow

The French-Canadian cow is easy to keep. She thrives and gives a good profit in places where other breeds would pine away or would not find sufficient feed to maintain their lives. The little care that she has received, specially during the winter months, has made her accustomed to hardships and therefore she is hardy. The French-Canadian cow is a good "rustler", she is well adapted to farms where production is limited. Her qualities may be summed up as follows: rusticity, frugality, good dairying qualities, milk rich in fat, long milking period.

Going back to the origin of the breed, we find that it has a common origin with the Jersey and Guernsey breeds, and that the Normandy and Brittany cattle, introduced in Canada at the beginning of the 17th century, also played their part. This breed is therefore one of the oldest found in Northern America. The influence of surrounding conditions, particularly the severe climate of the province of Quebec, and the treatment that the breed has received during those two centuries and a half, have caused changes in colour as well as in conformation, but aptitudes or qualities have been maintained. For this reason the French-Canadian breed of cattle has been termed the "Jersey of the North."

A characteristic of the French-Canadian cow is the production of rich milk, and under this head she comes between the Jersey and the Guernsey. Her milk yields an average of 4.5 per cent of fat, but she is not quite equal to the other breeds as regards the quantity produced. However, in order to qualify for the Record of Performance, a cow must give the following quantities of milk and fat in 365 days:—

Age	Milk lbs.	Fat lbs.
2 years	4,400	198
3 "	5,200	234
4 "	6,000	270
5 "	6,800	306

To-day, in localities where this breed is raised on a scientific basis, endeavours are being made to improve it as regards fineness of form, early maturity, increased weight, and milk production, while keeping at the same time the percentage of fat.

Although the French-Canadian cow is an old breed in the province of Quebec, it is only recently—about 1880—that the work of improvement was begun, and only in 1886 that a Herd Book was established by the Quebec Legislature. A new impulse was given to the improvement of the breed in 1895 when the French Canadian Cattle Breeders' Association was established.

The colour of the French-Canadian cattle varies from solid black to fawn, but a brown skin is preferred, and in this case there is a yellow or fawn stripe along the back and a grey or yellow ring around the muzzle. It should be stated here that this fawn colour, this stripe and this grey circle do not, in any way, indicate infusion of Jersey blood in Canadian cattle, as is so often claimed. There is nothing astonishing in the fact that rather striking similarities are found among animals of both breeds; it simply shows their identity of origin.

Does the French-Canadian cow deserve to be kept? The results obtained in the Pan-American contest of dairy cows held at Buffalo in 1901 show

that the French-Canadian deserves a place of honour among the cattle of North America. The following is taken from the Herd Book of Canadian cattle, vol. 1, page 11:—

"Cost of feed to produce 100 pounds of milk:—

For Canadian cows	45·8 cents
Jerseys	51 "
Guernseys	50 "
Ayrshires	44 "
Holsteins	41 "
Shorthorns	54 "

"Cost of feed to produce 1 pound of butter:—

For Canadian cows	11·03 cents
Jerseys	13·16 "
Guernseys	11·11 "
Ayrshires	11·61 "
Holsteins	13·18 "
Shorthorns	14·22 "

"It may be seen therefore that the French-Canadian cows come third in cost of production for milk, and first as regards the cost of production of butter."

Although this report is an old one and the cost of production of 100 pounds of milk or of a pound of butter is no longer the actual cost, these figures give a comparison between these various breeds as regards the cost of production of milk and butter. Other examples might be quoted to show that the French-Canadian cow is an economical producer of butter.

Cow Testing

Cow testing is our great means of improvement. The yield of milk and butter given by our cows has been regularly checked. It is by means of constant testing and of the stimulation that it gives that we have succeeded in establishing a herd composed of cows with very satisfactory yields, as proved by the figures appearing in this article.

Cow testing enables us to eliminate from the herd cows which do not pay; it is the best way to improve a herd in a very few years. Of course, cow testing must be followed up by liberal and scientific feeding and a careful selection of breeding animals. We cannot recommend too highly the regular testing of each one of the cows of a herd. Every time that we have the opportunity to do so, we advise the breeders to join a cow testing association as we are convinced that this is the best way to increase the production of milk. If there is an advantage for the breeder to adopt cow testing, this advantage is much greater when the farmer keeps pure-bred animals, owing to the increase in value that a record gives to the progeny of a good dairy cow.

Cow testing is now generally practised in Canada. Cow testing associations are established in all the provinces of the Dominion. The last report of the Chief Dairy Extension Agent shows that the province of Quebec is greatly ahead of the other provinces in the number of cows tested. It is also shown that the general average per cow has increased since cow testing was practised, having gone up from 5,285 pounds of milk and 195·5 pounds of fat in 1915, to 5,801 pounds of milk and 214 pounds of fat in 1921; but this production is still too low.

Let us see the averages that were obtained at the Oka Agricultural Institute during the milking period extending from June, 1921, to June, 1922, with the same care and the same feed that may be given by any breeder.

The general average of the herd was:—

	lbs.
Milk	8,901
Fat	346
Butter	407

The average production of Ayrshire cows was 8,984 pounds of milk and 345 pounds of fat, or 406 pounds of butter; whilst the average production of French-Canadian cows was 8,345 pounds of milk and 361 pounds of fat, or 425 pounds of butter.

In the milking period of 1918-19, we secured as an average 7,667 pounds of milk for Ayrshires and 6,624 pounds for French-Canadians showing an increase

of 1,317 pounds of milk per cow in the first case and 1,721 pounds of milk in the latter one.

Our ambition is to have a herd entirely composed of cows qualified for the Record of Performance. Although we entered this test only in 1918, we have succeeded in qualifying, so far, as many as thirty-six cows. The average production of Record of Performance cows is, for the Ayrshires, 9,884 pounds of milk and 386 pounds of fat, and for the French-Canadians, 8,580 pounds of milk and 386 pounds of fat. It should be stated that several of these cows have competed in the the two-year class.

Although such results appear to be quite satisfactory for a herd including about fifty cows, we do not intend to stop there. We will endeavour still to increase the production per head by the means already mentioned: selection, better feeding, and the use of sires selected with the greatest care. We are putting great hopes on the sires we now have in order to attain this object.

Ayrshire Bull.—At the head of our Ayrshire herd, we have "Springburn Victory Bond"—58467—sired by "Glenhurst Torr Mayor"—43480—an ex-champion of Canada. His mother "Maple Leaf Jean"—47434—is a well-known cow in the Ayrshire world. She is not only remarkable by her conformation, which is almost ideal—the prizes she has won in the fairs prove this—but also by her high milking qualities. At the age of four years, in Canada, she made a record of 12,356 pounds of milk and 472 pounds of fat in 315 days milking. In 1919, at the Toronto exhibition, she won the silver cup presented by Mr. Turner for the best cow entered in the Record of Performance.

Representatives of the Ayrshire Herd at the Agricultural Institute, Oka, Que.

In its issue of December, 1920, *The Field* of New York gave the annual yield in milk and fat of "Maple Leaf Jean," purchased by the "Middlesex Meadow Farms" for $5,000. This semi-official record was given as follows: milk, 16,271 pounds, fat, 614·69 pounds. But in 1922, this cow beat her own record, giving 18,078 pounds of milk and 618 pounds of fat in 310 days milking, thus winning the world's championship in her class.

As an exhibition animal, "Maple Leaf Jean" won prizes wherever she was shown. In its issue of August last, *The Canadian Ayrshire Review* stated: "During her career as a show animal, 'Maple Leaf Jean' won the following honours: 1916, 1st prize at Huntingdon and at the National Exhibition of dairy cattle; 1918, 1st price and champion at Ormstown, 1st prize for milk production among cows qualified in Record of Performance, 1st prize at Ottawa in the dry cows class and champion No. 2 (reserve champion); 1919, 1st prize in the dry cows class, 1st prize for cows qualified in Record of Performance—senior and grand champion at Toronto; 1920, 1st senior and grand champion at the Maryland exhibition, 1st prize for milk production (H.R.) at the National Exhibition of Dairy Cows; 1921, 1st senior and grand champion at Brockton, 1st prize in a contest for the production of butter at Waltham.

"No cow of the Ayrshire breed has equalled this record, whether as regards prizes won in fairs or for persistency in milking."

The above shows that "Maple Leaf Jean" is remarkable both for her successes at fairs and for her unequalled milking qualities. The many records that she has made also demonstrate her robustness. We can therefore justly be proud to possess the son of such a famous cow, and we hope that her progeny will inherit her qualities. "Springburn Victory Bond" is now four years of age and weighs 1,810 pounds.

French-Canadian Bull.—Our French-Canadian bull, "Ottawa Beau Second"—5344—supplied by the Central Experimental Farm, is out of "Denise Fortune"—3807—whose record at three years of age was 10,133 pounds of milk and 471 pounds of fat.

Holstein bull.—Korndyke King Raymondale—49839—is our Holstein bull, whose mother, Raymondale Helena Korndyke, at the age of one year ten months and 25 days made a record of 20·20 pounds of butter and 425·40 pounds of milk in seven days milking. This cow has five sisters with a record of over 30 pounds of butter in seven days' milking. The sire has also five sisters with a record, one of which is a world's record. Among the ancestors of Korndyke King Raymondale the following should also be mentioned: Avondale Pontiac Echo—18352—having fifty-one daughters qualified and who is himself out of May Echo Sylvia by King Artis Canada—10042—and also Korndyke Queen Dekol 6th—27465—with a world's record in seven days of 37·26 pounds of butter and 781·0 pounds of milk; her highest production in one day being 122 pounds of milk.

Sanitary Stables

But all those means of improvement of the dairy herd (scientific and generous feeding, cow testing, use of a good bull) would be of no avail if the rules of hygiene were not observed. It is well known that the more animals are improved and specialized in their line, the more particular they are as regards the surrounding conditions in which they live. In order to satisfy their needs, the stables in which they live should afford sufficient space as well as a good cube of air. If cows are kept in small and partly ventilated stables, their vitality is bound to be weakened and they become more susceptible to contagious diseases. A sanitary stable therefore should be spacious, well ventilated and well lighted.

In order to provide for these conditions, the Oka Agricultural Institute has built a new stable, arranged as follows: the new building include two wings placed at right angles with the modern barn built in 1916, and each of these wings can accommodate thirty-six cows. The sanitary conditions are of the best, and the general arrangement is pleasing and attractive for the staff and the pupils at work on dairy experiments, as it is well known that pleasant surroundings make for efficient work. The work has been made as light and as easy

as possible. Water is supplied automatically in individual fountains. Each of the two stables includes two rows of stalls, and the cows are placed head to head, a labour-saving arrangement, as regards distribution of feed. The troughs are joined together in order to facilitate cleaning, and provided with traps and drains by which they may be easily washed. There is ample space, abundant light and plenty of fresh air.

The nature of the ground and the buildings already in existence did not allow us to place this stable as we would have liked. In the construction of stables, it is recommended to set the building north and south as regards length, so as to have the two faces exposed east and west. With this arrangement, in the case of a cow stable, the sun's rays strike the building directly in the course of the afternoon and if the cows are put in the stable for milking, they may suffer from the heat unless milking is delayed until late in the evening. This is why an east and west setting, with the long side of the building north and south, so as to have more of the morning and noon sun in winter months, is preferred by some practical men.

Whatever may be the value of the various theories, we have chosen the middle course, since our stables are placed northwest and southwest as regards length, and face southwest and northwest. There are sashes on three sides of the building. The only part that has no sash is the gable at the north west end. In this way the sun's rays penetrate the stables all day, either on one side or on the other.

The stables are fireproof. No wood whatever has been used in their construction. The sides are of hollow cement brick, and where the walls include only one row of bricks, they are covered with terra-cotta, and the whole is coated with hydrated lime.

The roof is of reinforced concrete, six inches thick. Above this concrete roof are two rooms, one of which is filled with white asbestos, so as to prevent any dripping and keep the temperature of the stable normal. The ceiling is pierced with ten openings with triple

Cows of the French-Canadian breed in the herd at the Agricultural Institute, Oka, Que.

sash, giving abundant light in the building. The roof is supported by twelve iron pillars, also used as supports for the stanchions.

Cement being a good heat conductor, a concrete floor is naturally cold and may be the cause of udder troubles or even of abortion. These difficulties are corrected by the use of a thick litter, or better by covering the part of the stand on which the cow lies with cork bricks or creosoted blocks of wood, placed vertically. These bricks, as well as the blocks, are warm and last a long time. This is how this part of our stables was built: A layer of stones was put on the earth, then a layer of cinders from 4 to 6 inches thick, then hollow bricks of terra-cotta cemented in, then a coating of 1½ inches of cement. The front part of the stalls on which are the front legs of the animal, is made of creosoted blocks of wood, making a stand not so hard and less slippery, thus preventing injuries to the knees.

Each of the stables measures 75 feet long by 40 feet 8 inches wide and 11 feet high, thus insuring a cubic space of over 900 feet for each of the 36 cows that they may contain, which is amply sufficient. The stalls are arranged in two longitudinal rows, which saves time. The passage behind the cows is eight feet wide, and this makes it possible to keep the outside wall clean, which is rather difficult to do when the passage is only three or four feet wide.

To make it easier to keep the cows clean, it is important that the gutter be wide enough, as if the gutter is narrow and not deep enough, the manure accumulates and soils the hind quarters of the cows when they are lying down. In our stables the gutter is nine inches deep on the stall side and six inches on the opposite side. It is 20 inches wide, with a double slope, ½ an inch on the side of the passage, and one inch by 8 feet on the side of the liquid manure tank. The length and width of the stalls vary, according to the size of the cows that are to be placed in them, from 4′ 6″ to 4′ 8″, and the width from 3′ 4″ to 3′ 7″. The trough is 24″ wide and 6″ deep; the angles are oval; the bottom of the trough is one inch higher than the floor of the stall, thus making it easier for the cows to get their food. The central passage is 7′ wide.

Fresh air is necessary for the maintenance of good health, without which the milk flow cannot be of long duration. In fact as regards milk production, pure air is almost as necessary for dairy cows as feed and water. A good ventilation system is indispensable in the stable, for cows in poor health cannot be profitable producers. Therefore the number of fresh air openings was not spared in this stable, although care was taken, at the same time, not to lower the temperature in the stables below the normal temperature which should be about 50 degrees F. If the temperature is lower, not only do the cows yield less, but they consume more feed for the maintenance of bodily heat. When the temperature in the building is sufficiently high, the renewal of the air takes place through convexion. This is one of the chief factors responsible for the circulation of air in buildings inhabited by animals. The air warmed by the contact with the animals rises towards the top part of the building and is replaced by pure air coming from the outside.

The fresh air openings measure 8″ x 5″, and are ten in number; they are placed every 15 feet on each side of the stable, and are supplied with a regulator. Fresh air comes in through an opening, above the foundations. It passes into a chimney made of cement blocks, forming part of the wall of the stable, and enters the building nine inches from the ceiling. The openings of the ventilators for the escape of foul air are also situated at the ceiling and at the centre of the stable. They are three in number and measure 15″ x 15″. With this system of ventilation, the animals are not exposed to chills through drafts of air coming from the outside.

If fresh air is necessary, sunlight also plays an important part in the maintenance of the health of live stock. The germs of contagious diseases are soon killed by direct sunlight. In addition, an abundance of light keeps the atmosphere of the stable dry, which also contributes to the comfort of the animals. For economical and sanitary reasons there are double sashes. The panes of single sashes soon become covered with ice in winter, making the atmosphere in the stable damp and unsanitary, preventing the sun's rays from penetrating inside and causing a great loss of heat.

There are 45 sashes in each stable, including those in the ceiling, giving an area of 9′ 8″ per cow. These sashes are divided in two parts, the top part covers one-third of the total height, and opens by means of hinges; the interior sash opens from top to bottom, and the inside one from bottom to top. If at certain times of the year the sashes are to be used for ventilation purposes, the air coming from the outside is directed towards the ceiling, and does not cause any discomfort among the cows. This arrangement of the sashes compels the air to make a curve which slows up its process and allows it only slowly into the stable.

The New Dairy

The care taken in the handling of the milk has a great influence on its conservation and therefore on its value. To prevent milk from taking a stable odour and to keep it its sweet pleasant flavour, it should be taken to a separate room, some distance from the stable. With this object in view, during the summer, a dairy was built, communicating with the two stables which are about 50 feet away from each other. This dairy includes two rooms, one of which is specially arranged for cooling the milk.

Manure Tank and Shed

The last improvement I desire to mention is the construction of a liquid manure tank and a covered shed, thus completing our new dairy barns. The liquid manure tank, of cylindrical shape, is made of cement blocks. It measures 12 feet high and 20 feet in diameter. Its capacity is of 22,600 gallons of liquid manure. This is sufficient to hold all the liquid manure from 125 cows during six months. This tank is in close proximity to the manure shed, which is about fifty paces from the new stables. This shed includes a square platform of 25 feet by 25 feet, surrounded by a cement wall, 4′ feet high, topped with a galvanized iron covering 12 feet high, and lastly with a wooden roof, covered with galvanized iron shingles. Manure is brought to the shed by means of litter carriers, or in summer it is thrown directly into the spreaders, and in winter into wagons, to be taken directly to the fields.

AGRICULTURAL MERIT DAY IN QUEBEC

THE Agricultural Merit celebration, held this year at the Quebec National Exhibition, was an event of an unusually imposing and impressive character, surpassing in importance that of any previous year.

On the morning of the 6th of September, 1922, all the laureates of the Order of Agricultural Merit, wearing their badges, met on the Agricultural Merit square at the Exhibition Park, and while Mr. Hildebert Létourneau of St. Pierre de Montmagny, recipient

of the gold medal for this year, hoisted the official flag of the order at the mast of honour, the band played "O Canada", and each and every assistant paid homage to agriculture.

A parade then took place of all the laureates through the central avenue of the park, as far as the stand, where rewards, medals and diplomas were distributed.

A handsome silk flag, with the Agricultural Merit colours, was presented to the Minister of Agriculture, after the reading of an address expressing the gratitude of all the citizens for the valuable services that he had rendered to agriculture in the province. In his reply the Minister took advantage of the occasion to recall the modest beginnings of the Order. Established in 1890 by Honoré Mercier, the Order has known days of decline, as have all human institutions, but a new impulsion was given in 1917, and since that time it has progressed every year in number of members and in importance. While there had been only about 200 competitors in a period of twenty years, nearly 500 have been recorded since 1915.

The surviving laureates, carrying the flags of the Order, were presented to the crowd by the Minister of Agriculture and greatly cheered.

The young laureates of the Juvenile Order of Agricultural Merit, established last year, were also awarded decorations. The winner of the gold medal, Irénée Provost, aged 12 years, received a splendid pure bred filly, and the winner of the silver medal, Ph. Rhéaume, aged 11 years, received a Planet machine.

This year's ceremonies were invested with a special character. It was the first time that the highest religious authorities of the land were represented by Canon Arsenault, special envoy of Cardinal Bégin, besides the highest civil authorities, in the person of the Lieutenant-Governor.

The series of feasts is generally closed every year by a banquet given to the laureates. This year the banquet was characterized by the distinction of the guests and the eminence of the speech makers. Those who spoke on this occasion were Messrs. L. A. Taschereau, J. E. Caron, W. R. Motherwell, Dominion Minister of Agriculture, Michaud, A. Grenier, O. Lessard, G. A. Bouchard, J. H. Grisdale, Joseph Samson, mayor of Quebec city, and others.

The Order of Agricultural Merit is the only institution of the kind in America. The credit of its establishment belongs to the province of Quebec, which always leads in all agricultural innovations as well as in all patriotic movements.

AGRICULTURAL MERIT AWARD

ON the recommendation of Mr. J. Ed. Caron, Minister of Agriculture for the Province of Quebec, Mr. Oscar Lessard, secretary of the Council of Agriculture, has been awarded the diploma of Very High Merit in Agriculture by the Provincial Government as a recognition of his services to the cause of agriculture since he has been in the employ of the Department of Agriculture.

Mr. Lessard, who has been secretary of the Council of Agriculture since June, 1909, has been in the employ of the Government for thirty-two years.

This diploma was awarded Mr. Lessard under an amendment to the Revised Statutes of 1909. Under the old Act this reward could be granted only to persons residing outside of the province. Under the amendment passed last year, this reward may be granted to all residents of the province who have given signal service to agriculture. Three residents of the province received this distinction prior to Mr. Lessard: Mr. I. J. A. Marsan, secretary of the Judges of Agricultural Merit, Mr. Aug. Dupuis, horticulturist of Saint-Roch-des-Aulnaies, and Dr. J. C. Chapais.

BETTER FARMING TRAIN IN THE PROVINCE OF QUEBEC

A BETTER farming train, arranged for by the Provincial Department of Agriculture with the co-operation of the Canadian Pacific Railway Company, is now touring the province of Quebec. This train is under the direction of Mr. Alphonse Désilets, B.S.A., Director of Agricultural and Economic Science teaching, and Mr. J. Dougall, of the Canadian Pacific Company. It includes fifteen cars, each dealing with a branch of agriculture, as follows:—

1. Grading of hogs;
2. Feeding of live stock;
3. Breeding bulls and bacon hogs;
4. Live stock judging;
5. Dairy cows;
6. Sheep and hogs for slaughtering;
7. Dairying and co-operation;
8. Field crops;
9. Rural engineering and farm buildings;
10. Horticulture and fruit culture;
11. Poultry;
12. Beekeeping and maple sugar;
13. Home industries;
14-15. Administration and management.

The contents of these cars are interesting to both farmers and city residents alike, and both will find a visit profitable. There are miniature models of dairy and farm buildings. All the things that may interest the market gardener are found among the exhibits. Keepers of poultry will find some fine exhibits of the best breeds of fowls and, in addition to public demonstrations, information is given directly by the chief of this department. All those interested in maple sugar-making, beekeeping, underdrainage, field crops or horticulture, are sure to get useful lessons and valuable information.

In the Home Industries Department, products revealing the industry and skill of the Canadian woman are shown.

Splendid specimens are exhibited in the Live Stock car and competent lecturers, with the assistance of capable demonstrators, teach the best methods of breeding.

Lectures and demonstrations are given from 10 a.m. to 10 p.m. at every stop. The professors and lecturers are the following: Rural economy, Mr. A. Désilets; live stock, Messrs. X. N. Rodrigue, J. Gautreau, E. N. Bonneau, I. R. Martin and Ph. Rodrigue; dairying, Louis Bibeau; field crops, A. Mathieu, P. H. Vézina and Emila Lods; farm buildings, B. Chartier; drainage, R. Barbin; horticulture and floriculture, Gabriel Billault and J. Cholet; fruit culture, J. M. Talbot; poultry, L. Crevier; management of the maple sugar bush, L. J. A. Dupuis and A. Lalonde; agricultural co-operation, Ls. Bérubé; home industries, L. M. Gagnon, Mlles. Leblanc, Duval, Durand, Couturier and Paré and Mme. Lacroix. Messrs. M. Morissette and J. Morin are the supervisors of the train. The teachings of the day are summed up every night by lantern slides.

THE CONGRESS OF QUEBEC WOMEN'S CLUBS

THE second general convention of the Women's Clubs (Cercles de fermières) of the province was held at Quebec from August 30 to September 5, 1922, under the patronage of Mr. J. Ed. Caron, Minister of Agriculture.

The congress was held in conjunction with the Quebec National Exhibition. About 200 delegates, representing 70 clubs, including about 5,000 members, distributed in 40 counties, attended the sessions, under the presidency of Mr. Alphonse Désilets, B.S.A., General Superintendent of the Clubs.

The programme, which was very comprehensive, included the following lectures, given by the officers of the Department:—

"The farmer's wife at home," by Mlle. Eveline Leblanc.

"Agricultural representatives and Women's Clubs," by Mr. F. N. Savoie.

"The farmer's wife in the garden," by Mr. J. H. Savoie.

"The Women of Acadia," by Mlle. Benoite Leblanc, of the Department of Agriculture of New Brunswick.

"Domestic science teaching," by Reverend O. Martin.

"Keep the girls at home," by Judge Choquette.

"The farmer's wife at school," Mr. C. J. Magnan, general inspector of Catholic schools.

"The Women's Institutes," by Miss Eleanor M. Roach, director of English Clubs.

Appropriate speeches were made by Mr. J. Ed. Caron, Mr. Antonio Grenier, Mr. F. N. Savoie, etc., congratulating the women for their work, and specially Mr. Désilets, their energetic superintendent.

Saturday afternoon, after a general gathering at the Louis Hébert's monument, the delegates visited the city, and on Sunday afternoon they were received at St-Jean, Ile d'Orléans, by the club of the parish. A social evening organized by the club was greatly enjoyed by the excursionists. On the closing day, an official flag, green, white and yellow, was drawn and won by Mme. Painchaud, secretary of the Ile de la Madeleine Club.

A banquet concluded a busy week which will rank among the best in the memory of the delegates.

MICHIGAN STATE EXTENSION SERVICE AND FARM BUREAUS

BY W. D. JACKSON, ASSISTANT DIRECTOR, ONTARIO AGRICULTURAL REPRESENTATIVE BRANCH

FIVE members of the Agricultural Representative service of the Ontario Department of Agriculture visited the State of Michigan during the month of June for the purpose of studying the work of the Agricultural Extension Service and Farm Bureau organizations of that State. The party motored through the counties of St. Clair, Lapeer, Tuscola, Huron, Sanilac, Genesee, Shiawsee, Jackson, Washtenaw, and Wayne. In each county the office of the Farm Bureau was visited, where the work of the Bureau and the State Extension Service was discussed with the county agent. Visits were also made to various co-operative organizations in the different counties, such as co-operative elevators, live stock shipping associations, and co-operative retail stores.

The Agricultural Extension Service and Farm Bureaus in Michigan are organized on the same basis as in New York and other states, although the Michigan State Farm Bureau has made

greater strides in linking the County Farm Bureaus up with the State Bureau, and in organizing state-wide selling agencies on a commodity basis.

Extension Service

The Agricultural Extension Service in Michigan aims to convey to the agricultural population of the State through its different agencies the best and most advanced information and methods regarding all phases of agriculture and farm practice, which, when adopted on the farms, will elevate the agricultural standing of the State and add to the well-being of its farmers. The Extension division is connected with the Michigan College of Agriculture at Lansing, and acts as the connecting link between the college and the farmers of the State, and in conveying the results of experiments and investigations to the rural districts. It co-operates with the following agencies: County Agricultural Agents, Home Demonstration Agents, Boys' and Girls' Club Leaders, the Farm Bureau and other agricultural organizations. Extension specialists attached to the Extension division and staff of the Agriculture College are available to assist the various agencies mentioned in carrying out their programme in any particular line of work. This organization links up the College of Agriculture very closely with the farmers of the State.

County Agents

In June last, Michigan State had 59 County Agricultural Agents and several assistant county agents. There were a number of Boys' and Girls' Club Leaders, and five or six Home Demonstration Agents, attached to the offices of the county agents. During the war period a large number of Club Leaders and Home Demonstration Agents were employed, but with the financial retrenchment which followed, the number has been greatly reduced.

The County Agricultural Agent is the county representative of the Farm Bureau and the State and Federal Departments of Agriculture, and acts in much the same capacity as an Agricultural Representative in Ontario. The work of the county agents is financed largely by the local County Farm Bureaus, and as the county agents are employed by these bodies their work is rather more commercial than educational.

Farm Bureaus

The County Farm Bureau is an association of farmers organized to develop agriculture and improve rural conditions by co-operating with township and county organizations and State and Federal Departments of Agriculture in planning and putting into effect the various projects outlined for the county agent, or other lines of work adopted for the improvement of agricultural conditions. The Farm Bureau elects at its annual meeting each year an executive committee which meets monthly or at stated periods to conduct the business of the organization. This committee secures the necessary funds, authorizes expenditures, and engages the County Agricultural Agent who has been approved by the Extension Division of the State Agricultural College. There are 97,000 farmers members of the Michigan State Farm Bureau. These members are signed up for a period of three years at a membership fee of $10 per year. Five dollars of this fee is retained by the County Farm Bureau, four dollars and fifty cents goes to the State Farm Bureau and fifty cents to the American Federation of Farm Bureaus. Twenty-five cents of the fee retained by the County Bureau is set aside as a subscription fee for *The Farm Bureau News,* which is published by the local organization and edited by the county agent.

The Michigan State Farm Bureau is the central head of the County Farm Bureau organizations, which represents and speaks for all the farmers of the State. Knowing that farmers must sell their products as well as produce them if they are to receive their full share

of the final returns, the Michigan Farm Bureau has committed itself to the commodity plan of organization for marketing farm products, and, as the general manager states "is lending its energy towards the construction of powerful selling agencies or exchanges for the handling of the major agricultural commodities of the State. These exchanges are directed and entirely controlled by the growers of the commodities, the Farm Bureaus plan contemplating only the federation of these exchanges so that they may work together more effectively to attain common ends." The membership in the Elevator Exchange, for example, is made up of the hundred or more local co-operative elevators throughout the State. The Elevator Exchange sells the produce and makes returns to the local co-operative elevators, which in turn make returns to their individual members. The farmers have a voice in the management of the exchange through their elected representative from the local co-operative elevator. The same plan applies to the Live Stock, Potato, Fruit, Sugar Beet, Milk, and Produce exchanges.

The State Farm Bureau maintains for the benefit of its members seed, wool, purchasing, traffic, legislative, educational, and auditing departments. These various departments are maintained on the basis of services at cost and serve county farm bureaus, local co-operative organizations, and the commodity marketing exchanges. The local farmers organizations have taken every advantage of this service offered by the State Farm Bureau and have therefore been able to place practically all of their organizations on a sound and permanent working basis.

The State Farm Bureau is directed by an executive or governing board, elected by the directors from the various county farm bureaus at their annual convention. The future plans of the organization provide for an affiliation of the commodity marketing organizations with the State Farm Bureau on the basis of their common interests. Under this plan the Exchanges will have representation on the executive of the State Bureau and the Bureau in turn will be represented on the executive of the various marketing exchanges. This plan links all the farmers' organizations very closely together for the development of agriculture through the States from both the production and marketing standpoint.

THE FARM BUREAU AND ITS BRANCHES

R. Schuyler, Agricultural Representative, Brant County, Ontario

THE Michigan State Farm Bureau is located at Lansing and may be said to be the executive organization representing the different branches contributing toward its support, namely, the purchasing department, seed department, wool exchange, traffic branch, and the publicity and auditing branch, representatives from each of which together appoint their officers who direct the operations of the State Farm Bureau. These officers consist of a manager and secretary-treasurer with helpers. The directorate of the Farm Bureau is influential in deciding the agricultural policy of the State, the secretary-treasurer sitting on many State Agricultural Committees. Practically all commodities produced on Michigan farms are handled through this organization or affiliated organizations; for instance, the Live Stock Exchange located at Detroit and the Potato Exchange at Cadillac have a working agreement with the Farm Bureau whereby each assists the other in selling commodities if necessity arises.

The purchasing department is but recently organized, but the intention is

that it shall purchase through its manager for its members all the commodities used on the farm. There are some six hundred co-operative associations in the State, a large portion of these working in co-operation with the Farm Bureau.

The seed purchasing department not only purchases seed for the farmers of the state but seeks to promote the best varieties of farm crops, first by locating them, second, by assisting the College in trying them out, and third, by selling them to the members after they are proven to be of value. This department alone did $3,000,000 worth of business last year. There is no government standard for seeds in Michigan, but the Farm Bureau has established what is known as "The Farm Bureau Standard," and all bags are branded as such. Their standard is above the government requirements, and all seeds handled by them are returnable if not of the quality specified. They are now the official distributing agents for the North Dakota and the Idaho Grimm Alfalfa Seed Growers. The farmer or "local" may consign seed to the association to be cleaned and sold. An advance is then made of 50 per cent of the value. As soon as cleaned and placed in bonded warehouses the banks will loan up to 90 per cent of the value at 7 per cent interest. This enables them to finance the purchases until sold.

The wool exchange operates on lines similar to that of the Canadian Wool Growers, Limited. Wool is handled co-operatively through the farmers' clubs or other local organizations, shipped to a central warehouse, graded and sold to the highest bidder, the proceeds after paying necessary expenses being returned to the grower.

The work of the traffic department is to look after the adjustment of improper freight rates, overcharges, or anything else in connection with general freight traffic has to do with the shipping from any organization in the state affiliated with the Bureau. As an example of their work, the Pere Marquette railway officials intended closing their railway line running into northern Michigan, which of course would have been a hardship to the shippers of that district. Through the efforts of the traffic department this road was kept running, thereby enabling the people of that district to ship out their produce.

The publicity department is the only one that is not self-sustaining, the others contributing towards its support. It is very far reaching in its work, which is really divided in two divisions, namely, legislative and educational. While they do not as a department openly discuss politics, yet, every public question pertaining to agricultural betterment is freely discussed from a neutral point of view. Educational work is carried on very extensively. Timely articles are presented showing the advantages of co-operation, giving the current wool prices, pointing out the work of the Farm Bureau and its value to the individual farmer, and generally bringing the work of the organized agricultural co-operative movements before the public mind. As the papers of the state which co-operate with the Department have over 1,500,000 circulation, a great many people are reached by the Bureau. Both the County Agents and the College Faculty contribute toward the press despatches.

The auditing department maintains a staff consisting of a manager and two assistants. Their duty is to audit the books of the various departments. They also assist all locals in establishing systems of records, audit books in case of financial difficulties, and help in any way they can to get them started in their work. A charge is made for services rendered sufficient to cover the expense of operating.

THE MICHIGAN FARM BUREAU EXCHANGES

By A. C. Knight, Agricultural Representative, Victoria County, Ontario

The Elevator Exchange

THIS exchange was started one and a half years ago with twenty locals. At the time of our visit one hundred elevators or shipping centres were doing business with the central exchange. Before becoming affiliated the officials of the shipping centre are required to sign a contract agreeing to sell their surplus through the Exchange, or pay the usual charge for such commodity. A fee of two hundred dollars is also charged each local. This fee may be paid in a lump sum or ten dollars per car until paid. The money so collected is held as a stock liability, and is returnable should the concern go out of business.

The Elevator Exchange sells beans, grain and hay, and cars are billed direct from shipping point to destination. The regular charge for beans is $20 per car, 1½ cents per bushel on wheat, and ¾ cents on oats. Hay is sold on a straight commission basis. During the busy season as many as sixty cars have been handled in one day, and this year they expect to do a business of $6,000,000. Last year they handled 800 cars of beans, or one-fifth of Michigan's output.

Advance payments are made to the locals by drawing on the banks against the bills of lading. Final settlement is made when returns are received from the shipment. Daily market reports are issued from head office advising locals when to ship, or when to hold as the case may be.

The charter of this exchange, as of all the others mentioned, will not allow them to sell for non co-operative concerns. Business is handled upon established trade rules, and any surplus is pro-rated back to the locals according to the business done. The manager receives a salary of $10,000.

The Cadillac Potato Exchange

This is a separate organization composed of over 50 shipping centres controlled by the Cadillac Potato Growers' Association. Business is conducted in much the same way as with the Elevator Exchange, and there is a mutual agreement between the two concerns for selling potatoes. The Potato Exchange sells potatoes for the Elevator Exchange, and vice versa.

The Produce Exchange

This branch of the Bureau is located on the Detroit Eastern Market, and has been operating since June 1. With two locals shipping, the Exchange was paying its way. A charge of 5 per cent is made on eggs and poultry, and 10 per cent on fruit and vegetables. They also handle veal and dressed hogs. In time they expect to establish grades, and grade at the local shipping points. Each day's receipts are pooled.

The Live Stock Exchange

This Exchange is located in Detroit at the Stock Yards, which are owned by the Michigan Central Railway. They have been operating since May 1, and by June 15, controlled one-third of all the stock arriving at the yards. This progress was facilitated by the fact that there is very little f.o.b. buying in Michigan.

In order to get a start a commission firm was bought out, and their share of the yards taken over. They are classed as outlaws by the Commission Men's Association which will not admit them to membership.

The Exchange treats each shipping centre as an individual but sells each man's cattle according to the individual markings.

Charges for operating are as follows: For six cattle or more the rate is $20

per car. A single deck of hogs or lambs $14, and a double deck $20. Where stock is delivered by wagon or truck the charge for cattle is $1 per head, and for sheep or hogs 20 cents per head. These charges are the same as those made by the other firms doing business on the yards.

The Exchange so far has carried its own insurance on live-stock in transit. A charge of 5 cents per cwt. is made which has been sufficient to cover all losses, and is much cheaper than through the insurance companies. When stock arrives at the yards they are automatically covered by a policy in the Hartford Company.

Like the Elevator Exchange and the other exchanges mentioned, any surplus accumulated is distributed to the locals according to the business done. They aim to charge enough to safely cover expenses, to pay good salaries to the best men available, and to cover anything required for emergencies. Any surplus over these legitimate charges goes back to the producer. As one of the managers put it. "We are working for the farmer, not working him."

IMPRESSIONS FROM A TRIP THROUGH THE STATE OF MICHIGAN

By W. P. Macdonald, Agricultural Representative, Lambton County, Ontario

THE farmer of Eastern and Central Ontario is astonished to see the variation in farming conditions, methods and type of farming, soils and topography of the country, when he has an opportunity to visit the southwestern counties of the Province of Ontario. To continue the journey westward across the State of Michigan will also bring forth many surprises. The St. Clair river, Lake St. Clair and the Detroit river, not only separate the State and the Province, but on the east and west side of these waters a different type of farming is followed and the topography of the country is entirely changed.

The well-known flat, prairie-like areas of Western Ontario are not to be found when crossing into the State of Michigan, this state having probably formed a shore line when the deep alluvial soils of Western Ontario were being laid down as a lake bottom. The absence of herds of cattle, especially beef cattle, roaming the pastures is practically the first observation the Ontario visitor would make. Dairy farming is principally followed on all "mixed" farms. Holstein cattle were in the majority on the farms, but there are many fine herds of Ayrshire and Jersey cattle. The feeding and finishing of heavy beef steers, as practiced in Huron, Middlesex and Lambton counties, is not followed by the Michigan farmer in his farm practices. There were comparatively few cattle to be seen anywhere in our tour. Grain crops were more in evidence than clovers. Rye, beans and oats and small areas of fall wheat were the principal crops. Fields had not the well-kept appearance of Ontario. The lighter, sandy soil of the state may account for a large preponderance of weeds.

The methods of farming practised did not impress me as being so universally thorough as in Ontario. On the whole, conditions around the Michigan farm homes and buildings appeared prosperous. Abundance of paint is almost universally used. At least 90 per cent of the farm buildings are painted and, in the majority of cases, the name of the farm and the owner appears on the barn.

A feature of a great many barns is a large open shed or "lean-to" each side of the barn. These sheds are used

for the feeding of sheep. The Ontario farmer is a feeder of cattle. These sheep and lambs are purchased on the western markets by the Michigan farmer in car lots and fed for market. It was learned that in some cases the feeders contract with the western ranches for their lamb crop months before the lambing season.

The Michigan farmer is given more to specializing in crops than the Ontario farmer. Visits were made to farms where the production of rye or beans was the chief farm operation. The conservative spirit of the Ontario farmer is not so prevalent in Michigan. There are many large-scale farmers. Fifty to one-hundred-acre fields of potatoes were not uncommon. One farmer visited had 125 acres in green peas, all harvested in the pods and sold by the bushel on the Detroit market. Following close after peas was 125 acres of green corn to be harvested and marketed by the dozen ears. These crops formed this farmer's early cash crops, together with tomatoes. The main business of this farm was the production of improved seed.

The road system of the State of Michigan is a great deal in advance of the Province of Ontario. The perfect condition and the number of state highways is very noticeable to an Ontario visitor. These highways are a large per cent concrete and asphalt pavement. Where traffic does not demand pavement, gravel is being used. A noticeable fact on the gravel roads is the amount of loose gravel surfacing the whole road. This gravel is not piled yards deep in the centre of the road but is spread out thinly all over the road, thereby not acting as a hindrance to motor travel but giving sufficient gravel for a proper levelling and filling for the successful work of the road-drags or planes. Road building is being vigorously carried on by state and county systems. The motor car is more in evidence on Michigan rural roads than in Ontario. A horse and buggy was seldom seen on a Michigan road in a week's travel.

An Ontario agriculturist's visit to Michigan would not be complete without a visit to the State Agricultural College at Lansing. The College farm is a fair representative of soil conditions of the portion of the state which we visited—a light sandy soil with smaller areas of a more loamy nature. The Farm and College departments for demonstration, experiment and investigation were quite similar to those of the Ontario Agricultural College.

The Michigan State Farm Bureau, with headquarters in Lansing, is a state farmer organization worthy of the investigation of the Ontario farmer. The Farm Bureau methods of improving the marketing conditions of the farm products of the state are bringing good results.

GIRLS' CLUB WEEK IN MANITOBA

BY S. T. NEWTON, SUPERINTENDENT, EXTENSION SERVICE

THE Manitoba Girls' Club Week held in Winnipeg from September 4-9, was a big success. Forty-five Manitoba Demonstration Teams, each with three members, and three United States teams, two with two members and one with three members, were present throughout the week. A full programme of sightseeing and entertainment was provided, but the main feature of the week's programme was the annual competition to decide the champion demonstration teams of the Province.

In order that the Manitoba girls might get some idea as to how their work compared with that done in the United States, arrangements were

made for the champion demonstration teams from the states of Iowa, Minnesota and North Dakota to come to Manitoba and put on their regular championship demonstrations. As the Minnesota team was first last year at Sioux City and Iowa second in an interstate competition where the champion teams from twelve states were competing, Manitoba considered it a distinct honour to have the privilege of listening to the very best demonstration teams on the continent.

Among the subjects on which demonstrations were given were the following: Bread Making; Quick Breads; Macaroni; Milk Products; Beverages; Table setting; Vegetables; Canning; Care of the Baby; First Aid; Attractive collars and cuffs; comfortable footwear; The Model Kitchen; Art needlework; Sewing; Textiles, and Garment Dyeing.

Each demonstration occupied from 35 to 45 minutes, during which time one or other of the members of the

Girls' Club Week in Manitoba: The visiting champion Demonstration teams from Iowa, Minnesota and North Dakota are shown above, together with the Pilot Mound, Man., bread-baking team, which secured the highest score during the week in the Manitoba contest.

The competition in Manitoba has been particularly keen. Several teams having commenced work on their demonstrations nearly a year ago with the result that the quality of the demonstrations given surpassed all expectations and competent critics felt that the Manitoba high scoring teams compared very favourably with the visitors; in fact the highest score made during the week was credited to the Pilot Mound Bread Baking Team.

team was discussing in carefully prepared language the salient points of the subject while the other two members were performing the various mechanical operations connected with the subject.

Not infrequently questions were asked either by the judges or some one in the audience, and the ease in which the questions were answered showed that the girls were thorough masters of their subject.

The judges were Miss Josephine Arnquist, Girls' Leader for the State of Iowa, Miss Julia O. Newton, Home Demonstration Agent Leader for Minnesota, and Miss Margaret Speechley of the Manitoba Agricultural College, Winnipeg.

The trip to Winnipeg of so many of the girls who had achieved success in their own district was made possible through the co-operation of The T. Eaton Co., The Western Canada and Lake-of-the-Woods Milling Companies, The Junior Red Cross, and the Winnipeg Teachers, with the Manitoba Department of Agriculture. Each of these organizations asked that the work be continued in 1923, as they considered it the finest kind of community work yet attempted for the purpose of developing interest in better homemaking and in more approved methods of farming.

This year there was one boys' demonstration team, trained by W. R. Leslie of the Morden Experimental Farm. They made such a good showing that next year it is confidently expected there will be at least twenty-five boys' teams.

"FIELD DAYS" IN SASKATCHEWAN

IN Saskatchewan agricultural meetings under the auspices of agricultural societies have usually been held in the towns, and almost invariably during the winter months. This year a new form of extension work was undertaken under the designation of "field days". The attempt was made to get as closely in touch with the farmers as possible by holding meetings at the homes of successful farmers and during the season when field crops were at their best. These gatherings were somewhat experimental and this year only two were held, but the consensus of opinion would indicate that these meetings will be very popular and productive of good results.

In choosing the location for the gathering or picnic, care was exercised to select the farm of a man who had made a success of farming and who was well liked in his community. In one instance a farm was chosen where there was a silo (the only one in the district), a herd of good Holstein cows, a milking machine, good buildings, and considerable acreage sown to corn, sunflowers and sweet clover. The speakers made use of these features as they applied to the subjects dealt with.

The programme began at 3.30 p.m., and included addresses by the Minister of Agriculture, the Dairy Commissioner of the Department of Agriculture, and by representatives of the Field Husbandry and Animal Husbandry departments of the University of Saskatchewan. At six o'clock those present, numbering approximately 500 in one instance and 750 in the other, partook of a picnic supper, after which the programme of addresses continued for another hour.

The interest at both places was exceptionally keen and it is likely that such gatherings in somewhat modified form will become annual agricultural society events.

The meetings were organized by the Extension director of the University and arranged for by the local agricultural societies.

A SEED GRAIN MARKETING PLAN FOR ALBERTA

IN accordance with plans to encourage the production of pure seed on an extensive scale in the province of Alberta, the marketing of seed grain will be undertaken by the department of agriculture.

The plan involves not only the distribution of seed for production purposes as formerly, but contemplates also the establishment of a cleaning and grading plant at Edmonton, through which all seed grain to be marketed under the new plan will be handled, and further provides for the advancement to the farmers, on consignment of seed grain to the government plant, of sixty-five per cent of the commercial elevator price, with a certificate covering the balance. The seed will be sold to the best possible advantage and the balance, after expenses are deducted, will be paid to the growers.

It is anticipated that 100,000 bushels of seed grain of all varieties will be handled under the new scheme this year. The handling and marketing is to be under the supervision of the field crop commissioner. In the marketing of the seed grain, the government will have regard first for the Alberta market, after which outside markets will be sought.

The field crops branch of the department of agriculture will inspect the growing grain produced from the registered seed supplied. Any farmer, however, who can satisfy the crops commissioner that he is growing seed grain eligible for registration, and can pass inspection of the commissioner, will have the opportunity of marketing his seed under the new government scheme.

Producers of good seed in the province will be encouraged to patronize the new marketing plan, under the conditions stipulated. It is emphasized that the individuality of the seed will not be lost at any stage, but retained throughout the whole marketing scheme.

PART III

Agricultural Education and Related Activities

AGRICULTURAL INSTRUCTION IN THE ELEMENTARY SCHOOLS

What is the aim or purpose of elementary agricultural instruction? Is it vocational or pre-vocational or simply educational? What success has attended its introduction in the schools? The accompanying articles give a résumé of the situation in three provinces, and it is hoped to continue the series in succeeding issues.—*Editor.*

BY F. W. BATES, M. Sc., DIRECTOR OF SCHOOL AGRICULTURE FOR SASKATCHEWAN

THE reasons assigned for placing Agriculture on the Elementary School curriculum are so many and so varied and the results obtained in actual practice so diverse that a restatement of the whole case should be of interest at the present moment. Although much has been done it is yet too soon to reach a final conclusion as to the true value of elementary agricultural instruction nor is it fair to condemn it because of failure in presentation. After many years of experiment the teaching of arithmetic in our schools is far from satisfactory while grammar and history still prove stumbling blocks in the path of many otherwise successful teachers. In these subjects the range of material as well as the limits of the field are quite clearly defined. On the other hand, Agriculture is a growing science whose subject matter is constantly increasing since it draws on the whole field of experimental science. In addition it is a practice with frequent change of method and application. It is not strange therefore that the most extreme opinions as to its success and value as a public school subject should be held.

To discuss the problem adequately, the following points must be carefully considered. What is the aim or purpose of elementary agricultural instruction? Is it vocational or pre-vocational in the accepted sense of those terms? Or is it simply educational? Then what range of work should be attempted and what methods employed in the presentation? Finally, what success has attended the effort and is it worth the time and energy expended?

In Saskatchewan, Agriculture has been a subject of study in the public school for many years but for the past seven years special efforts have been made to make the work more efficient. This article does not claim to deal with the general problem but rather to discuss what has been attempted in this province and to draw a few conclusions therefrom.

In the first place, the aim or purpose of the course is the development of a more efficient citizenship. It is not taught to keep boys and girls on the farm but it is believed that the education of our youth whether on the farm or in the town is incomplete without some knowledge of the part agriculture plays in human affairs. It is hoped that the wider knowledge thus acquired will tend to counteract the drift to the cities and result in a better balance in every phase of our national life. Agriculture, therefore, is included in our Course of Study because it is a basic industry in our civilization, not because Saskatchewan happens to be an agricultural province. The subject thus regarded can

scarcely be called vocational or even pre-vocational. It is simply educational.

From this standpoint, Agriculture cannot be treated in a technical way especially in the lower grades. It is more the attitude of mind that is of value than the material used. It implies the fullest use of the environment in teaching drawing, arithmetic, language, etc. The foundation of geography are laid in the study of convenient land and water forms and weather observations. The inter-relationship of plant and animal life gradually comes to view as the common living things are watched and studied. From the beginning, the natural inclinations of children to make collections, keep pets and work in the soil, are utilized in developing the powers of observation and expression.

Toward the middle period of the public school life, the work assumes a more practical phase with the introduction of school gardening. The purpose of the garden is not the growing of produce but the development of the child. Here, at first hand, he learns in some measure how to control the great processes of nature and achieves the joy of creation. The garden becomes a laboratory and the study of plant and animal life proceeds from a new angle.

In the upper grades the work assumes a scientific phase. The pupil draws conclusions from his own experience and that of other pupils. Laws are discovered and experiments devised for further and more thorough investigation. At this point a whole new range of study opens up. The relation of plant and animal life on the farm, the place of machinery, marketing, farm management and the more general problems of production come under review. Not only is the experience of the pupil studied but his information is organized and related information sought and incorporated.

What success has attended the effort? As far as examinations are an indication of success, progress is being made, but the greater and more important part of the work cannot be measured in this way. General conditions in the provinces do not favour the development of gardening on the school grounds but there is a constant increase in the use of the home plot. The school exhibition, while not essential to the course, serves to indicate what is taking place. Each year the quality of vegetables and grains exhibited improves, showing at least a better knowledge of standards and more careful selection. The projects conducted by the boys' and girls' Clubs, however, give the best indication of progress as here we find the school definitely linking its activities with the home life. The increase in the number of pupils engaged in this work is quite gratifying when it is remembered that no grants are paid by the department and all expenditures must be borne locally.

As in all phases of school work, the ultimate success depends on the teacher. It is gratifying to note that an increasing number of teachers realize the true place of agriculture as a school study and are doing everything in their power to give the boys and girls a better appreciation of this great fundamental industry.

The value of such a course cannot be easily determined. Its success cannot be measured from the practical standpoint since it does not attempt to train in the practice of farming, neither can it be seen in the development of scientific farmers. Its effect must be sought in the better relationships between town and country, in the appreciation of the great place agriculture plays in human life and in the widespread acceptance of agriculture as an occupation worthy of the best brains and training in the community. To determine whether this ideal is being achieved requires time and it is yet too soon to attempt an answer.

The portion of the Agricultural Instruction Grant allotted to the Sas-

katchewan Department of Education has been expended in the training of teachers and in giving personal guidance and assistance in the development of every phase of activity which will make the course more efficient. As noted above, no grants are given in the Elementary schools either to teachers or schools doing the work or toward the conduct of school fairs. Consequently, what progress has been made is natural and it is hoped of permanent value.

BY R. G. VAUGHAN, DIRECTOR OF TECHNICAL EDUCATION, MANITOBA

AGRICULTURAL education as carried on in Manitoba is of two distinct types, (1) Vocational, technical in nature and taught to those who intend to profit by such instruction through farm operation or technical positions in professional agriculture; (2) General, scientific and social in nature, indispensable in any well-rounded educational programme for a country whose basic industry is agriculture.

It is with this general type that the public schools are mostly concerned. It is now conceded that a socialized curriculum necessarily includes participation in the industrial and agricultural life of the people, with such participation carried on in a spirit conforming to the age of the students, with special reference to their interest and ability, and possessing the greatest common factor of general, useful knowledge.

The most popular and we believe the most efficient method of embodying agricultural experience in the elementary schools is through the organizations of boys and girls clubs carried on co-operatively by the Departments of Agriculture and Education, the field administration being mainly in the hands of the Department of Education through the inspectors, supervisors and school principals with the details of outlines for study projects, demonstration teams, etc., being worked out by agricultural specialist. The value of having the work carried on by this method is that it becomes a community project in each district, all local organizations taking a part in its management and assisting financially and administratively in making the work of the club a success. The children are carrying on agricultural work along methods approved in scientific agriculture assisted and encouraged by their teachers and agricultural specialists, exhibiting results of their work and learning by experience and observation that intelligence, judgment and method, plus application, are prime factors in their relative standing in the community, and that agricultural education is of interest, of value and a mark of social approval rather than a task imposed. This work involves home projects in poultry, live stock, horticulture, field crops, cooking, canning, dyeing, and any other subject relating to the lives of agriculturalists.

The demonstration team has been one method of illustrating the value of proper methods in the agricultural work and makes its appeal through being conducted by students of school age. The fairs, held in the early fall, combine school work and home work, teacher, student and parent in the spirit of competition with a desire for relative individual progress. They thus take an interest in agriculture as a matter of national concern and by actual participation in a social movement gain some idea of their relative position in the economic structure of the country rather than gaining only a little information as a side issue. In the elementary grades of our public schools the children are not old enough to study from a purely personal vocational standpoint.

In the secondary schools agriculture has been carried on in a limited number of schools a half day per week through grades IX, X and XI, and is recognized

by the Department of Education and the University as part of the secondary school courses either for preparation for Normal School or University. The work covers Horticulture and Entomology in Grade IX, Botany and Field Crops in Grade X and Live Stock (including Poultry) in Grade XI.

Beginning in September 1922, provision will be made in two or three schools to modify the course of study in these schools to replace the botany and elementary science so that, for those taking the agricultural work in high schools, the botany will be included in the course and be of a practical nature directly applied: their Entomology for example, will be devoted particularly to insects of economic importance. The aim is to increase the value of the work by direct application without losing any values included in the work for which it is substituted.

There is room for agricultural winter courses in many of our high schools to which the older boys could come and take work similar to the diploma course given at the Agricultural Colleges, but their work would be more vocational and including only the required citizenship courses in addition to the agricultural work taken up. Several courses such as these have been carried on in the agricultural centres here previous to the war.

In regard to the Boys' and Girls' Clubs, we feel that it has had favourable opportunity and has been well worth while. The fact that over thirty thousand boys and girls are now included in the membership list gives evidence that it is favourably received in the country. The finances for carrying on the fairs, etc., are raised very largely through local contributions. On the whole the result has been very satisfactory; any difficulties encountered have been due chiefly to local reasons.

With reference to agricultural work in secondary schools we feel that this will be a distinct advantage to our secondary school course. It will be necessary to secure teachers well trained in agriculture as well as in other subjects to get the greatest value from this plan, but it should be taken as part of a general education. To make the work of winter courses in rural schools a permanent feature, credit for the work covered will need to be given by institutions carrying on agricultural education.

BY DR. J. B. DANDENO, INSPECTOR, ELEMENTARY AGRICULTURAL CLASSES, ONTARIO

IN the Public and Separate schools of Ontario agricultural instruction is given, in a regular way, in about 2,000 schools. As the subject is entirely optional, it might be inferred that whatever progress has been made is likely to be reasonably permanent. In these schools, agriculture can not be considered vocational excepting incidentally. In fact it may be said to be non-vocational.

From our experience in Ontario we can say with some degree of assurance that non-vocational agriculture is the only kind that will take a permanent hold upon the schools, and for two reasons: (1) At the age in which such instruction is given—namely from eleven to fourteen or fifteen—the vocational aspect can not materially enter. Very few persons at such an age will be able to decide the matter of a vocation even if the inclination to do so had already taken a hold upon the individual, which, in the vast majority of cases, it has not. (2) Vocational agriculture will never find much support in our scheme of education, so far as the primary or secondary schools are concerned, for the simple reason that, with the average boy, such education can lead only to the position of hired man. The capital required to start business as a farmer is too great. To expect a boy to enter enthusiastically upon a course which leads only to a

position as hired man, is expecting more than will be realized. Agricultural education, or better still, educational agriculture, is not vocational in Ontario.

Is non-vocational agriculture worth while? Let me point out the advantages as far as our experience goes: (1) Boys and girls gain a new viewpoint with respect to the occupation of farming, and, therefore, are inclined to look with more respect upon such occupation, consequently there is less inclination to leave the farm. (2) Education in other respects becomes more real—History becomes more interesting when associated with the origin of our breeds of farm animals, with the Noxious Weed Act, with the warfare with insect pests; Geography means more when the study of soil and climate is associated with the growing of wheat, clover, or tomatoes; Arithmetic will not prove such a difficult subject when problems and calculations arise out of school or home garden, or out of other matters with which the pupil has had a personal contact; Art is real art in the making of a neat garden, lawn, or window box; Language is more effective when relating to the work of the day or of the experiences at home; the rudiments of science have their best foundation in elementary agriculture.

The evidences to support these statements are, perhaps, not as tangible as one might expect, but they are none the less real. A visit to those schools which have been carrying on classes in agriculture for some time will show the thoughtful observer that an important movement is operating.

In Ontario agriculture is not called rural science, it is called agriculture and the subject is made as real as possible. Rural science (but there is no such thing any more than there is urban science, or metropolitan science, or Saskatchewan science, or Yukon science, or international science) would tend to defeat the end we are aiming at. It tends to lead in too many different directions, when we want to lead in one direction. Some consider rural science a sort of camouflage to cover a multitude of subjects, the word "rural" intended to catch the eye of those from the country, and the word "science" to dignify it by giving it a name to which educationists will not object. To my mind, the use of this term has had something to do with the question which has just been raised,—"Is non-vocational agricultural teaching in the public schools proving worth while?" To ask such a question of those concerned with the teaching of agriculture in the Public Schools of Ontario would be almost like asking if it were worth while to waste food by taking physical exercise.

High Schools—Vocational agriculture in High Schools has not had a fair trial in Ontario because such instruction receives no recognition by the higher institutions of learning. It is not recognized by these institutions as education. No recognition is given, nor is likely to be given, to vocational agriculture on the matriculation examination. Moreover, as has been mentioned in connection with public schools, vocational agriculture leads only to a job as hired man. It can hardly even be called a trade.

Non-vocational agriculture is now provided for in the High Schools of Ontario and recognition is given on matriculation examination. This has been in operation, however, for only one year, hence little can be said about the results.

Of course, agricultural education as we have it in Ontario is necessarily, to a certain extent, vocational. This was shown during the war. It was quite apparent then that the instruction given was readily adaptable to the production of food. The schools at once took hold, and, through the efforts of teachers and pupils, material assistance

was rendered to the nation. Eggs, poultry, potatoes, beans, etc., were produced and without any material added cost. The pupils took hold with enthusiasm not less than the soldiers in the firing line. In fact, they considered themselves a part of the army. They learned a certain amount of real war history as they could have learned in no other way. If war were declared tomorrow, this army for production is ready.

PART IV

Special Contributions, Reports of Agricultural Organizations, Publications and Notes

THE PASTEURIZATION PROCESS AND ITS EFFECT ON THE VITAMIN CONTENT OF MILK

BY A. BRUCE MACALLUM, M. D., Ph. D.

WITH the advancement of knowledge in dealing with epidemic diseases and infective organisms brought into the system by means of the food supply, special attention has always been devoted to the preparation of milk which shall be relatively free from pathogenic forms of infection. The various agencies by which milk can be infected—the cow, the stables, attendants, in transportation and subsequent delivery—are not within practical methods of control, especially in such large units of population as our cities, while the distance from the point of origin to the ultimate consumer may often be over a hundred miles; therefore, some means must be taken to render milk more or less clean from a bacteriological standpoint before delivery to the consumer.

The method almost universally adopted by the large milk distributing plants in American and Canadian cities and towns is that known as the pasteurizing process. It derived its name from the fact that Pasteur found that it was unnecessary to kill all the organisms in milk to keep it fresh, but that a moderate degree of heating would kill practically all the putrefactive and fermentative organisms. The term is employed in commercial dairy practice to include all processes by which the milk is heated from 130 to 180° F. for periods of twenty minutes to half an hour. While this process improves the keeping qualities of milk, at the same time it does not produce chemical changes which may damage the nutritive qualities of some of the principal constituents, which result from sterilization by means of boiling. It must be borne in mind that pasteurized milk may contain dangerous organisms, yet practical experience has so well proven the many benefits derived from its use in infant feeding that it is universally recommended by hygienists and all modern milk distributing plants pasteurize milk which is specially prepared for infants.

Milk as intended by nature should contain all the essential elements of a complete diet for the adolescent mammal. It should, therefore, in its natural state, contain all the vitamines which have been found essential for the growth and maintenance of life of the young; but the vitamin content will again depend on the diet of the cow, since neither the mammary gland nor any other maternal tissue can synthesize these compounds. It must be emphasized here that in this regard milk does not exhibit any uniformity; that is, equal volumes of milk from different sources do not necessarily have the same proportions of these accessory factors, but they will vary in proportion to the amounts present in the diet of the cow, which also exhibits a variation in vitamin content of a seasonal nature. Again, milks from different sources may show considerable differences since Osborne and Mendel (1) found that the milk employed by them in their experiments was much lower in its vitamin content than that used by Hopkins since they had to use

four to six times the quantity to get the same effect on their growth curves. While all the vitamines are present, the fat soluble, water soluble and antiscorbutic factors, these also may exhibit variations in respect to each other which are referable back to the diet of the animal in question. As a general rule raw milk usually is well supplied with the water and fat soluble factors but wide variations in the amount of the antiscorbutic element must usually be expected and discounted in advance by the paediatrician.

Taking into consideration the possible effect of the pasteurizing processes upon the vitamin content, there are three possible factors, reaction of the milk, oxidation and heat, which may exert a destructive influence upon these essential elements. In the first place the reaction of the solvent medium is of some importance since the degree of destruction by pasteurization will be negligible when the reaction is neutral or acid and accentuated when it goes over to the alkaline ranges of pH concentration. Milk, however, is amphoteric in reaction and the alkaline range found in milks in practice is usually not sufficient to produce any noticeable effect on the water soluble factor since this is found apparently unimpaired in milks which have been heated to boiling or even undergone desiccation; and milk which has been heated to 120° for an hour will still display its close approximation to its original antineuritic value (2). In so far as these experiments on guinea pigs are of any value in their application to the practical side of the milk problem, one can be fairly safe in assuming that pasteurization has no appreciable effect on the water soluble or antineuritic factor.

In the case of the fat soluble vitamin the amount present will vary with the ration of fresh green food or bran consumed by the cow, but the average quality of milk distributed in this continent is quite adequate in its content of this essential element. While no actual experiments upon milk itself have been carried out, it has been found that concentrated preparations of this vitamin made from butter fat and cod liver oil can stand the action of live steam for several hours; (3) and autoclaved milk will also display considerable activity in regard to the fat soluble factor in satisfying the requirements of guinea pigs (2). Subsequent experiments have shown that atmospheric oxygen combined with various degrees of heating is the destructive agency responsible for the diminution of this particular vitamin; since butter can be heated in an autoclave to 120° for several hours and remain unaffected, but deterioration takes place if the butter fat is heated and aerated. Pasteurization in a closed container therefore should exert no appreciable damage on the physiologied activity of the fat soluble element.

Milk as an antiscorbutic on the other hand shows wide variation in its protective power, even when fresh, and failure to recognize this fact is responsible for much of the conflicting clinical evidence concerning the respective virtues of raw and pasteurized milk in the prevention of infantile scurvy. That such a variation could exist was known as far back as the middle of the last century when Curran (5) noted the outbreak of scorbutic symptoms where 1 pint of raw milk was included in the daily ration over a period of five to seven months. Further experimental evidence on the point has recently been furnished by the study of experimental scurvy upon guinea pigs. The results obtained in this manner show that in addition to the stock diet of oats, bran, water and autoclaved milk, quantities from 50-100 cc. of fresh raw milk daily exerted only a partial antiscorbutic effect and a minimum of 100 cc. per diem was necessary to produce a definite protection against the development of scurvy (6). A similar result has been obtained in the case of monkeys where a large quantity of fresh raw milk, upwards of 100 cc. daily, was needed to prevent the

onset of this disease. In both cases such a quantity would practically confine the diet solely to milk to get the fully protective effect, a condition practicable only in the case of infants, where the diet is exclusively confined to milk, and in this latter case Hess (7) places the minimum at 500 cc. per diem in order to provide a reasonable margin of safety. Another factor in causing variation in the antiscorbutic vitamin of milk is the effect of the seasonal variation of the diet. Since the antiscorbutic vitamin is found in the green fresh vegetables, leaves and grasses, the summer milk would be more powerful in its antiscorbutic effect than the winter milk, when the diet would consist largely of dried stored foodstuffs of low antiscorbutic value. Hart and his collaborators (8) in a series of studies upon experiment scurvy in guinea pigs found that 50 c of milk produced during the summer had the same protective capacity as 75 cc. of milk obtained when cows were upon winter rations. In another serie of experiments of this type (9) the milk of cows consuming a dried ration was markedly defective in its antiscorbutic power, but improved and reached a maximum when the animals were placed on pasturage for several weeks. Subsequent research upon the protective power of milk powders has demonstrated that those prepared from milk of cows fed upon summer rations are of higher quality than those prepared from milk produced during the winter months (8).

Turning to the consideration of the effects of pasteurization upon the antiscorbutic vitamin, it has been found by actual experiment that in the case of cabbages heating in water at 140° C for one hour had destroyed 70 per cent of the antiscorbutic vitamin originally present. This is comparable to the effect that the pasteurization process would produce in milk and this furnishes an example of the possible extent of the damage. The question of the role of pasteurization of milk in the production of infantile scurvy has been a question of much dispute by clinicians in the past and a survey of the literature on this disease by one of the authorities (10) would seem to indicate that this method of treating the milk was responsible for the outbreaks in a great many cases. The most significant evidence is furnished by the experience of Hess (11) who reported cases of subacute infantile scurvy which developed in a series of cases in a large pædriatic clinic. These had been furnished with a milk diet pasteurized at 165° F for thirty minutes. The cases required seven to nine months for the symptoms to appear and then only in a mild form. The diagnosis of subacute scurvy was confirmed when the symptoms disappeared after the administration of a raw milk diet. A subsequent series of cases developed when the pasteurization was carried out at a lower temperature (145°F). Some months after the installation of a pasteurization plant at a large dairy in Berlin a series of cases of infantile scurvy developed and an investigation fixed the responsibility upon the pasteurizing process. After this was discontinued the epidemic declined and a normal state of affairs ensued. Hess has called attention to the fact that milk pasteurized in the home by the small domestic installations was of greater antiscorbutic capacity than milk so treated in large institutions or large dairy plants. He attributes the difference in the latter case to the storage before use after the pasteurization and the mechanical treatment involved in the commercial process. Forty-eight hours after the treatment the antiscorbutic power had declined over the index found at immediately after pasteurization. He goes so far as to state that "Raw milk must not be considered as having potent antiscorbutic properties," (13). Again " in numerous communications published during the last few years, we have laid emphasis on the fact that pasteurized milk possesses still less antiscorbutic power than raw milk; that, indeed it is not sufficiently rich in this 'vitamin'

to allow a positive balance to be maintained, so that infants fed for a considerable period on pasteurized milk develop a mild type of scurvy. We wish to point out again that this deficiency of pasteurized milk is due only in part to its having been heated, that much of the antiscorbutic factor is lost subsequent to the heating in the course of handling and ageing of milk so that pasteurized milk contains considerably less of the vitamin factor after forty-eight hours than it did immediately subsequent to heating——. It is probably exceptional for a well marked case of scurvy to develop on a diet of pasteurized milk, for enough of the protective substance remains to avert this disaster."

Pasteurization has repeatedly demonstrated, by the beneficial results following its adoption, in the bacteriological control of the milk, that it would not be expedient to sacrifice this all-important gain for the doubtful advantage of preserving unimpaired a trace of the antiscorbutic vitamin. When milk is employed as the sole diet for infant feeding some extraneous source of the antiscorbutic element must be provided. The fruits of the citrus type furnish abundant supplies of this important material and orange or lemon juice should be administered. It can be given to infants one month old, and the routine practice is to give a teasponful diluted with water, and sugar added, if it is tart. It has the advantage that it can be given even where there is a tendency to diarrhoea. When the stomach is unable to stand the acidity of the juice, it can be rendered alkaline with lime water or baking soda immediately before use. A cheaper source of the antiscorbutic factor has been suggested by Hess in the form of the juice of canned tomato which in spite of the canning process and subsequent prolonged storage has demonstrated a fair protective capacity. The juice is strained off and two tablespoons per diem for babies over three months old is the routine dosage. Practical experience has shown that it is well tolerated by the infants. The juice of the swede turnip (14) prepared by grating the raw vegetable and squeezing the pulp with the fingers yields a juice of fair potency but must be prepared fresh daily. It is given in quantities of two tablespoonfuls at a dose and is now used in several infant clinics in England as a routine measure in the prophylaxis of scurvy.

Since pasteurization of the milk supplies for infant feeding is almost universal in America, steps should be taken to warn the public of the possible dangers that may follow its exclusive use. At the same time the measures taken to remedy the antiscorbutic deficiency outlined in the preceding paragraph should be encouraged through the agency of the Child Welfare Clinics and educational campaigns by the public health authorities, for it is in this manner that the users can be furnished with a milk safe from a bacteriological view and fortified in its antiscorbutic power by extraneous sources of this vitamin.

(1) Osborne & Mendel, J. Biol. Chem, XXXIV, 537.

(2) Delf-Biochem, J. XII, 416.

(3) Osborne & Mendel, J. Biol. Chem, XVI, 423.

(4) Hopkins Biochem. J. XIV, 720.

(5) Curran, Dublin J. Med. Sciences, VII, 83.

(6) Chick Herne & Skelton Biochem. J. XII, 131.

(7) Hess, Scurvy, Past & Present, p. 238.

(8) Hart Starboch & Eillis, J. Biochem., XLII, 383.

(9) Hess Unger & Supplee, J. Biochem., XLV, 231.

(10) Lane, Claypon, Milk and its hygenic relations.

(11) Hess, Scurvy Past and Present.

(12) Neumann Deut. Mech. Woch, XXVIII, 628.

(13) Hess & Unger, Am. J. Dis. Children XVII, 221.

(14) Chick & Rhodes, Lancet, Dec. 7, 1918.

DAIRY PRODUCTS, PRODUCTION AND VALUE

Table I shows the production and value of creamery butter in Canada by provinces for the year 1921 as compared with 1920.

I. QUANTITY AND VALUE OF CREAMERY BUTTER IN CANADA, BY PROVINCES, 1920 AND 1921

Province	1920		1921	
	Quantity	Value	Quantity	Value
	lbs.	$	lbs.	$
Prince Edward Island	1,166,032	674,744	1,109,546	452,523
Nova Scotia	2,503,188	1,518,757	3,094,768	1,306,465
New Brunswick	1,053,649	606,891	1,152,168	475,112
Quebec	41,632,511	23,580,949	42,575,392	15,431,962
Ontario	37,234,998	21,343,858	43,525,742	16,665,277
Manitoba	7,578,549	4,282,731	8,541,095	3,253,057
Saskatchewan	6,638,656	3,727,140	7,030,053	2,552,698
Alberta	11,821,291	6,555,509	12,929,264	4,478,585
British Columbia	2,062,844	1,334,624	2,818,552	1,277,409
Total for Canada	111,691,718	63,625,203	122,776,580	45,893,088

Table II shows the production and value of factory cheese in Canada by provinces for the year 1921, as compared with 1920.

II. QUANTITY AND VALUE OF FACTORY CHEESE IN CANADA, BY PROVINCES, 1920 AND 1921

Province	1920		1921	
	Quantity	Value	Quantity	Value
	lbs.	$	lbs.	$
Prince Edward Island	2,081,277	525,635	1,681,779	293,651
Nova Scotia	52,638	14,865	29,440	5,578
New Brunswick	1,235,008	336,409	1,100,382	203,941
Quebec	52,162,777	13,372,250	53,525,706	9,188,983
Ontario	92,784,757	24,605,823	103,135,613	18,604,766
Manitoba	116,229	31,611	255,829	47,341
Saskatchewan	28,367	7,790	22,659	4,209
Alberta	398,750	110,355	889,904	186,175
British Columbia	342,053	96,134	421,314	80,541
Total for Canada	149,201,856	39,100,872	161,062,626	28,615,185

Table III shows the quantity and value of the principal products of condenseries for 1920 and 1921.

III. PRODUCTION AND VALUE OF CONDENSED PRODUCTS IN CANADA, 1920 AND 1921

Kind	1920		1921	
	Quantity	Value	Quantity	Value
	lbs.	$	lbs.	$
Condensed milk	53,662,699	10,202,230	39,101,243	5,844,333
Evaporated milk	30,469,642	3,809,653	31,202,713	3,428,456
Skim condensed milk	363,294	18,723	1,096,006	39,082
Milk powder	7,574,668	2,178,176	1,493,909	492,042
Skim milk powder			5,012,700	811,006
Sterilized milk	7,608,927	785,044	6,696,264	719,009
Casein	109,958	19,233	98,136	9,814

Table IV gives, by provinces, for the five years for which the statistics are available, viz. 1917 to 1921, the total value of all the products of dairy factories.

IV. TOTAL VALUE OF ALL PRODUCTS OF DAIRY FACTORIES, BY PROVINCES, 1917-21

Province	1917	1918	1919	1920	1921
	$	$	$	$	$
Prince Edward Island	702,334	855,374	1,184,163	1,252,013	792,299
Nova Scotia	1,171,376	1,423,451	1,974,269	2,517,338	2,002,406
New Brunswick	589,235	768,034	1,167,256	1,196,354	897,288
Quebec	28,358,876	31,033,944	36,790,037	37,732,572	25,174,136
Ontario	48,720,706	54,785,716	69,897,519	75,926,248	49,865,759
Manitoba	4,124,190	6,119,219	7,042,646	7,788,178	5,066,015
Saskatchewan	2,375,399	3,261,222	5,042,377	5,536,245	4,197,808
Alberta	5,247,343	5,550,583	7,872,541	8,838,298	6,439,095
British Columbia	2,529,867	3,543,307	4,225,794	5,549,245	4,773,048
Total for Canada	93,879,326	107,340,850	135,196,602	146,336,491	110,207,854

NEWS ITEMS AND NOTES

From April to October 1924, a British Empire Exhibition will be held in London, England. A British Mission headed by Major E. A. Belcher is visiting Canada to explain the purposes of the Exhibition and to impress upon this country the opportunity of placing before the world evidence of her great resources and the products of her farms, forests and factories.

In 1921, eighty-six Illustration Stations were conducted under the Dominion Experimental Farm system, namely, eight in British Columbia, twelve in Alberta, twelve in Saskatchewan, thirty-two in Quebec, ten in New Brunswick, and twelve in Nova Scotia. Three additional stations were selected in British Columbia and in Saskatchewan for cropping in 1922. In the conducting of these stations, farmers set aside certain areas for demonstration purposes and undertake to co-operate with the officers of the division in the methods of cultivation adopted. It is not only to the soil and crops that attention is devoted, but the dairy herd and poultry also come in for consideration. Special efforts are made in the restoration of the soil, in the introduction of new crops and increased production by the old ones, in illustrating the value of good, pure seed, in showing the importance of keeping farm accounts, in demonstrating the benefits derived from the systematic rotation of crops, in the growing of clover seed, in proving the value of drainage, in encouraging the growing of corn, in methods of growing and harvesting sunflowers, in summer fallow treatment, in the growing of alfalfa, in encouraging the production of fall rye, in the cultivation of a farm garden, and, in short, in helping and aiding in anything likely to result in an increase of information and of profit.

At a conference of shipping interests at Ottawa it was pointed out that, in the event of a store cattle trade being revived with Great Britain consequent upon the removal of the existing embargo, the absence of horns on cattle would be a great commercial asset to the Canadian farmer. Methods of dehorning are given in bulletin No. 15, "Dehorn your Commercial Cattle," which may be obtained on application to the Publications Branch of the Department of Agriculture at Ottawa.

The United States Department of Agriculture reports a survey of three representative areas in Indiana, Illinois and Iowa. It is shown that farmers with a college education received an average labor income of $463 more a year than the man with a high school education, and $979 more a year than the man with only a common school education.

Statistics furnished by the Dominion Department of Agriculture show that there were over 500,000 more milk cows in Canada in 1921 than in 1920, 400,000 more other cattle, 45,000 fewer sheep, nearly 400,000 more swine, and 6,600,000 more poultry.

Average values were much less last year than in the year before, dairy cows being placed at $51 against $80, other cattle at $28 against $47, sheep $6 against $10, swine $14 against $23, and poultry, $1.02 against $1.21.

The Dominion Bureau of Statistics issued on June 1, 1922, a preliminary statement of the production of the dairy factories of Canada for the year 1921, as compared with the final report for 1920.

The statement shows that the total quantity of creamery butter produced in Canada in 1921 was 122,776,580 lbs. of the value of $45,893,088, as compared with 111,691,718 lbs. of the value of $63,625,203 in 1920, an increase in quantity of 11,084,862 lbs., or 10 p.c., and a decrease in value of $17,732,111, or 28 p.c. The decrease in value was caused by a lower average price per lb., which dropped from 56c. in 1920 to 37c. in 1921.

According to the Fourteenth Annual Report of the Canadian Record of Performance for Pure Bred Dairy Cows, the number of cows that have qualified in the Record of Performance with records of 10,000 lbs. milk or over, is shown to have been 3,227 up to April 1, 1922. Given by breeds the figures are as follows:—Holstein-Friesian, 2,368; Ayrshire, 594; Jersey, 150; Shorthorn, 90; Guernsey, 16; French Canadian, 9.

It is interesting to note the business in dairy products that Canada does with the British West Indies and other British colonies as told in the News Letter of the Dominion Dairy and Cold Storage branch. To Bermuda in May of this year was shipped from this country 8,742 lb. of butter and 50 hundredweight of cheese; to British Honduras 731 lb. of butter, 6 hundredweight of cheese and 464 hundredweight of condensed, canned or preserved milk; to the British West Indies (Barbados, Jamaica, Trinidad, Tobago, and other islands) 32,614 lb. of butter, 519 hundredweight of cheese, 1,662 hundredweight of condensed, canned or preserved milk and 1,171 lb. of powdered milk; to British Guiana, 1,070 lb. of butter, 68 hundredweight of cheese, and 25 hundredweight of condensed, canned or preserved milk; and to Newfoundland, 21,270 lb. of butter, 371 hundredweight of cheese, and 246 hundredweight of condensed, canned or preserved milk. In addition small quantities of some of these products were exported to South Africa, China, Japan, St. Pierre and Miquelon, Costa Rica, Peru, Mexico, and Russia.

The Dominion Dairy and Cold Storage Commissioner, Mr. J. A. Ruddick, fresh from a trip across the seas, in noting the arrival at Liverpool of the largest single ship-load of butter ever sent from this country, namely 50,000 boxes, says that the chief complaint in England regarding Canadian butter is that it is over-salted, and that the demand is for mild butter. As the makers cannot tell whether their butter is for export or home consumption, it is urged as a solution of the difficulty that Canadian consumers be led to cultivate a taste for milder-salted butter than they have been accustomed to. The Commissioner says that larger supplies of Canadian butter of the right type would be welcomed on the old country markets.

The Canadian Record of Performance for Poultry was founded in 1919. The second year's record showed twenty per cent increase in the number of breeders who had given it their adherence, with an increase of birds entered of 69·5 per cent. Quebec showed the largest increase in breeders, and Ontario and British Columbia in birds.

The objects of the record are to develop and encourage the breeding of fowls that combine high production and standard qualities, and to secure for poultry breeders reliable information as to the sources of such stock. The keeping of records naturally leads to a knowledge of the best laying individuals, and to a recognition of individual parentage and ancestry or pedigree. Thus the establishment of the Record of Performance system is proving an immense step forward in the improvement of poultry breeding conditions.

So far British Columbia has made the best showing in percentage of birds qualified according to the number entered, Quebec coming second, Ontario third, New Brunswick fourth, and Saskatchewan fifth. Certificates are granted for birds laying 150 eggs in the fifty-two weeks and advanced certificates for birds laying 225 eggs. In 1919-1920, 17·2 per cent of the birds entered qualified, and in 1920-21 thirty per cent.

The estimated value of crops grown annually in greenhouses in Canada is upwards of three millions of dollars, and the area under glass is stated to cover about six million square feet of space.

Early in September a party of forty-three officials, county agents and farmers from the state of Ohio visited the European Corn Borer Laboratory at Port Stanley, Ont.

After visiting the laboratory, a trip was made in motor trucks to some of the more heavily infested fields. Stops were also made at the Dominion Government experimental control plots and at different fields where corn had been planted in accordance with suggestions made by the officers of the Entomological Branch. It was readily seen that late planted corn suffered less injury from the European corn borer than that planted earlier in the season.

The object of the trip, which was organized by the Ohio Department of Agriculture, was to bring to the attention of the farmers and county agents of that state the necessity of cooperative action in sections where the European corn borer is present and doing extensive damage.

The party was in charge of Mr. L. J. Taber, Director of Agriculture for Ohio, and included E. C. Cotton, Director of Plant Industry, Columbus; Prof. Raymond C. Osburn, Ohio University; Prof. Herbert Osburn, Ohio University; H. A. Gossard, State Entomologist; J. S. Houser, Assistant State Entomologist; T. H. Parks, Extension Entomologist, and N. E. Shaw, Columbus. Mr. W. A. Walton, Chief of the Division of Forage Insects, and Mr. W. L. Worthley, in charge of Corn Borer Control, of the United States Department of Agriculture, accompanied the visitors.

Mr. L. S. McLaine, Chief of the Division of Foreign Pests Suppression and Messrs. Crawford and Keenan of the Entomological Branch and Captain G. J. Spencer of the Ontario Department of Agriculture, conducted the party through the infested area.

The coliseum erected as the home of Canada's Royal Agricultural Winter Fair is said to be the finest building of the kind extant. It affords every facility for housing a big national show of the dimensions of the Royal.

A feature in connection with the Royal Agricultural Winter Fair will be a series of live stock judging competitions. There will be an inter-college competition for teams of five, and an inter-county competition for teams of five from any county in Canada.

The new dairy building at the Ontario Agricultural College, while not entirely completed, is sufficiently advanced for occupation. The building is a fine three-storied brick structure with well-appointed laboratories and lecture rooms. All the equipment is of the most modern and efficient type.

The Ontario Agricultural College opened this year with an attendance of approximately three hundred and sixty. The incoming year consists of ninety students. A new "intermediate year" has been inaugurated at the college, in which men who have completed the associate course can, by putting in an extra year's work, enter the regular degree course, for which matriculation standing is required. Ten men are taking advantage of this arrangement.

The Ontario Veterinary College, which has moved from Toronto to Guelph, is starting with an enrolment of 86 students.

In ten school fairs held in Essex County, Ontario, in 1922, 79 schools, 96 teachers and 3,000 pupils took part. Entries totalled 5,320 and 1,410 boys and girls gained prizes. The total attendance was 7,500.

The management committees for the fairs were composed of pupils, teachers and trustees supervised by the Agricultural Representative for the county. It has been found that local management contributes much to the success of the fairs.

Early last spring the Texas Gulf Sulphur Company offered to place at the disposal of the National Research Council $10,000 for the purpose of establishing fellowships for the encouragement of researches relative to the use in agriculture of elemental sulphur, both inoculated and uninoculated. This offer was referred to the Advisory Council of the American Society of Agronomy and, after due consideration, it was agreed to accept this fund, the selection of the fellowships and the direction of the research being placed in the hands of a Special Sulphur Committee of the American Society of Agronomy, this Committee being jointly responsible with the Division of Biology and Agriculture of the National Research Council.

The Special Sulphur Committee appointed by the American Society of Agronomy is constituted as follows: Dr. A. G. McCall, University of Maryland, Chairman; Dr. R. W. Thatcher, Director Geneva Station, New York; Dr. H. L. Shanta, Bureau Plant Industry, U.S. Department of Agriculture.

This committee has agreed that the work to be prosecuted under these fellowships will include investigations concerning the value of sulphur and the control of potato scab, nematodes, soil insects, and sweet potato diseases. Also the value of sulphur as a fertilizer for alfalfa and other legumes, and the effect of sulphur on alkali soils.

These fellowships will be awarded to graduate students in the universities and colleges or to competent assistants in the experiment stations. In every case it is expected that the fellow shall devote practically his entire time to the investigation with such course work as may be necessary for him to meet the requirements for an advanced degree.

It is the expectation that the fellowships will receive $1,000 a year and that the work planned will cover a period of three years.

Miss Catherine Graham, B.S.A., has been awarded a sulphur research fellowship by the National Research Council, Washington, D.C. It is understood that the award was made after a thorough study of her record as an undergraduate student, and after a personal interview with Miss Graham and also with Dr. J. H. Faull of the department of

botany, University of Toronto, under whom Miss Graham has been taking pathological work. Incidentally an investigation was made by the Special Sulphur Committee of the facilities offered by the pathological department of the University of Toronto. Miss Graham not only has an exceptional record as a student, but she gives promise of excellent work in the field of research.

She will continue her studies at the University under Dr. Faull's direction, devoting herself mainly to the investigation of sulphur in relation to potato scab and soil organisms.

The Director of Agricultural Extension of the University of Saskatchewan announces a series of short courses during January and part of February, 1923. Three courses of instruction will be given on internal combustion engines, including stationary and traction engines and automobiles; one course for creamery butter-makers, and one course in poultry husbandry.

Almost every department of the Government of Saskatchewan was represented at the fairs held at Regina and Saskatoon. One of the features was a moving picture tent where motion pictures were shown of the many different phases of public work The films shown comprised the following: Egg marketing in Saskatchewan; tree planting; grading stallions; better bulls; selecting a dairy cow; cream grading; judging beef animals; "Saskatchewan's Fight;" depicting the efforts being put forward at the Fort Qu'Appelle Sanitorium to fight the "great white plague;" boys' camps; "Nation Building in Saskatchewan," showing the work which is going on in the New Canadian settlements among the children; household science in Saskatchewan schools; "Through Life's Windows," showing the care and treatment of the eyes.

Community breeding of cattle has been undertaken in the districts of Turtleford and Aneroid, Saskatchewan. Both these districts have adopted the Ayrshire as the breed to be raised. For the Turtleford district eight carloads of high grade Ayrshire females have been purchased in the province of Quebec.

The famous Matador ranch, comprising 120,000 acres of federal grazing lands north of the Saskatchewan river, is being acquired by the Saskatchewan Government on leasehold terms for community grazing purposes.

Four of the Alberta schools of agriculture will conduct classes during 1922-23, namely those at Raymond, Claresholm, Olds, and Vermilion. A good attendance is looked for. At three of the schools special courses in irrigation will be given. The regular courses include practical and scientific agriculture for boys and home economics for girls. While both courses are complete in themselves, they also form the basis for advanced training at the University of Alberta.

The Alberta Provincial Live Stock Associations with headquarters at Edmonton, have decided to depart from the usual custom of holding an auction sale of sheep and swine this year. Instead, the Secretary, Mr. W. J. Stark, will list pure bred sheep and swine for sale at twenty-five cents per head. The listings will be classified according to breeds and mailed out to prospective purchasers who may deal direct with the breeders or through the Secretary. The stock listed for sale will be advertised in the agricultural press.

APPOINTMENTS AND STAFF CHANGES

Mr. Geo. E. McIntosh, Transportation Specialist, has been promoted to the position of Dominion Fruit Commissioner, succeeding Mr. C. W. Baxter, resigned. In his early life Mr. McIntosh was engaged in journalistic work in Lambton County, and took an active interest in the development of the fruit and vegetable industry. In 1911 at the request of the Ontario Fruit Growers' Association, Mr. McIntosh conducted an investigation into marketing conditions and transportation facilities for Ontario fruits, continuing work along this line on behalf of the Ontario Fruit Growers until 1917 when he was appointed Transportation Specialist in the Federal Fruit Branch. In conducting this work he has been in personal contact with the fruit and vegetable growers, shippers and carriers from coast to coast, and has become thoroughly versed in the marketing problems of the various provinces.

Mr. J. Sydney Dash, B.S.A., a graduate of the School of Agriculture, Macdonald College, Que., formerly Director, Station Agronomique, Pointe-a-Pitre, Guadeloupe, French West Indies, has been appointed Professor of Agriculture and Agronomy in the newly

created Tropical Agricultural College at Trinidad, B.W.I. For some months Mr. Dash filled the position of Supervising Seed Analyst to the Seed Branch of the Dominion Department of Agriculture from which position he resigned to take up his new duties.

In connection with the staff of the Ontario Agricultural College, a number of changes and additions are noted. Professor Sackville, for the past seven years connected with the animal husbandry department, is leaving to take charge of this department in the University of Alberta. His place here has been taken by Mr. J. C. Steckley, formerly agricultural representative for York county.

Mr. O. McConkey has been added to the field husbandry staff in the capacity of lecturer. He graduated from the College in 1917. Since then he has been taking post-graduate work in Alberta and Illinois.

Mr. G. E. Raithoy has also been taken on the staff of the animal husbandry department as lecturer. He graduated from the College last year, and was a member of the stock-judging team at Chicago representing the College.

Professor R. Newton of the Department of Field Husbandry, University of Alberta, has recently returned from the University of Minnesota, where he has completed his graduate studies and residence requirements for the degree of Ph. D. He has been promoted to the rank of professor in the Department of Field Husbandry and will proceed to study problems in physiology in field crop plants.

Mr. J. P. Sackville, Associate Professor of the Ontario Agricultural College, has been appointed as head of the Animal Husbandry department, in the College of Agriculture, University of Alberta. Professor Sackville succeeds Mr. Dowell as head of this department.

THE LIBRARY

LIST OF PRINCIPAL ACCESSIONS TO THE DEPARTMENTAL LIBRARY, INTERNATIONAL INSTITUTE BRANCH, DEPARTMENT OF AGRICULTURE

Cyclopedia of hardy fruits, by U. P. Hedrick. New York, Macmillan co., 1922. 370 p. il., col. plates.

Guide to the dissection and study of the cranial nerves and blood vessels of the horse, by G. S. Hopkins. Ithaca, New York State veterinary college, 1922. 41 p. 9 plates.

Impurities of agricultural seed with a description of commonly occurring weed seeds and a guide to their identification, by S. T. Parkinson, B.Sc. and G. Smith, B.Sc. Ashford, Kent, Headley Bros. 1921. 105 p. il.

An indexed system of veterinary treatment; a work on modern medical surgical, and biological therapy, by William Scott, F.R.C.V.S. London, Baillière, Tindell & Cox, 1922. 696 p. 195 figs.

Wild flowers of Western Canada, by W. C. McCalla. Toronto, Musson book co. ltd. 1920. 132 p. il.

Agriculture and the community, by J. F Duncan. Queensgate, Stirling, Scottish-farm servants' union, 1922. 119 p.

Feeding dairy cattle, by Prof. E. S. Savage. 4th edition. Syracuse, N.Y. Holstein-Friesian world, 1921. 118 p. il.

Trapping wild animals in Malay jungles, by Charles Mayer. New York, Duffield & co. 1921. 207 p. il.

Poor's and Moody's Manual of public utilities, 1922. 2480 p.

India on the march, by Alden H. Clark. New York, Missionary education movement, 1922. 179 p. il.

The building trades handbook. Scranton, Pa. International textbook co. 1921. 409 p.

Biology, by Charles Gramet, B.S. New York Globe book co. 1920. 115 p. (Globe outline series).

Twentieth century bird dog training and kennel management, by E. M. Shelley. Dayton, O. 1921. 98 p.

The practice of journalism, by Walter Williams and F. L. Martin. Columbia, Mo. Missouri book co. 1922. 328 p.

District school recitations, by Carleton B Case. Chicago, Shrewesbury publishing co 1917. 156 p.

The British bee-keeper's guide, by T. W. Cowan. London, British bee journal office, 1921. 226 p. il.

The British goat society's year book for 1922. London, 1922. 136 p. il.

Food friends we neglect, by C. H. Goudiss. New York, People's home journal, n.d. 87 p.

Wheat production in New Zealand, by D. B. Copland. Auckland, Whitcombe & Tombs, ltd. 311 p. diagrams. Bibl. pp. 308-9.

The northward course of Empire, by Vilhjalmur Stefansson. New York, Harcourt, Brace & co. 1922. 274 p. il.

The naturalisation of animals and plants in New Zealand, by Hon. Geo. M. Thomson. Cambridge, University press, 1922. 607 p. Bibl. pp. 569-584.

The direction of human evolution, by E. G. Conklin. New York, Charles Scribner's sons, 1922. 247 p.

The yeasts, by A. Guilliermond. New York, John Wiley & sons, 1920. 424 p. il.

Vital factors of foods, vitamins and nutrition, by Carleton Ellis and Annie L. McLeod. New York, D. Van Nostrand co. 1922. 391 p. il.

Vitamins and the choice of foods, by Violet G. Plimmer and R. H. A. Plimmer. Toronto, Longmans, Green & co. 1922. 164 p.

In Canada's wonderful northland, by W. T. Curran and H. A. Calkins. New York. G. P. Putnam's sons, 1920. 344 p. il.

Dictionary of husbandry, gardening, trade, commerce, and all sorts of country affairs, 2d, ed. London, W. Churchill, 1717. 450 p.

Poules qui pondent, poules qui paient, par A. J. Charon. Paris, Librairie agricole de la maison rustique, 1922. 236 p. il.

The federal service, by Lewis Mayers. New York, D. Appleton & co. 1922. 607 p.

Utilitarian economics, by F. W. Phelps and J. B. Myrick. Seattle, School of utilitarian economics, 1921. 261 p.

The microtomist's vade-mecum, by A. B. Lee. London, J. & A. Churchill, 1921. 594 p.

Basic slag and rock phosphates, by G. S. Robertson, D.Sc. Cambridge, University press, 1922. 120 p. il.

The microscope, by Lewis Wright, enlarged and rewritten by A. H. Drew. London, Religious tract society, 1922. 287 p. il.

The teaching of general science, by E. L. Eikenberry. Chicago, University press, 1922. 169 p.

Agricultural research and the farmer, by V. E. Wilkins. London, H. M. Stationery office, 1922. 168 p.

An introduction to the analytical chemistry of the rarer elements, by L. J. Curtman. New York, published by the author, 1922. 64 p.

Farm light and power year book. New York, Farm light and power publishing co. 1922. 338 p. il.

Electroculture, by A. C. Bennett. Sydney, N. S. W. Angus & Robertson, ltd. 1921. 118 p. il.

Sweet peas, by H. J. Wright. London, J. C. & E. C. Jack. 116 p. il.

Les stimulants radio-actifs en agriculture, par Lucien Fournier. Paris, Librairie de l'Institut national agronomique, 1922. 73 p.

Propagation of the dahlia, by C. B. Bolles. Media, Pa. 1922. 56 p. il.

Response in the living and non-living, by Sir Jagadis C. Bose. Toronto, Longmans, Green & co. 1922. 199 p. il.

Studies of plant life in Canada, by Mrs. C. Parr Traill. Toronto, William Briggs, 1906. 227 p. il.

Intensive strawberry culture, by Louis Graton. Whitman, Mass. 1922. 91 p. il.

Producing in little theatres, by Clarence Stratton. New York, Henry Holt & co. 1921. 258 p. il.

Principles of national economy, by T. N Carver. New York, Ginn & co. 1921. 773 p.

Under the roof of the jungle, by C. L. Bull. Boston, The Page co. 1922. 271 p. il.

Pocket companion for engineers, architects and builders. Pittsburgh, Carnegie steel co. 1921. 414 p.

DeRæf loose leaf manual on milk products. Kansas City, Mo. N. A. Kennedy supply co. 1921. 140 p.

La connaissance du lait, par Marc Fouassier. Paris, J. B. Baillière et fils, 1922. 136 p. il.

American poultry doctor, by N. W. Sanborn. Syracuse, N.Y. C. C. DePuy, 1913. 64 p.

Report on the poultry industry in the Netherlands, by Edward Brown. London, John Bale, sons and Danielsson, ltd. 1921. 136 p. il.

High egg production by individual hens, pens and flocks, by H. W. Jackson and G. M. Curtis. Quincy, Ill. Reliable poultry journal publishing co. 1922. 176 p. il.

United Ancona club year book, 1922. Franklinville, N.Y. 1922. 56 p.

The care of dogs, by A. F. Hochwalt. Cincinnati, Sportsmen's digest, 1922. 25 p. il.

Silver fox fur farming and its opportunities. Utica Central New York fur co. 12 p.

Principles of farm practice, by B. M. Davis. New York, D. C. Health & co. 1922. 350 p. il.

Community drama. New York, Community service, inc. 1921. 156 p. Bibl. pp. 122-155.

Community buildings for industrial towns. New York, Community service, inc. 1921. 94 p. il.

The agricultural index, 1919-1921. New York, H. W. Wilson, co. 1922. 1226 p.

How to teach agriculture, by A. V. Storm, and K. C. Davis. Montreal, J. B. Lippincott co. 1921. 434 p. il.

Farm projects, by Carl Colvin and J. A. Stevenson. Toronto, Macmillan co. of Canada, 1922. 363 p. il.

Practical farm accounting system. Coshocton, O. American art works, 1918. 48 p.

Economic developments in Denmark before and during the world war, by Harald Westergaard. Oxford, Clarendon press, 1922. 106 p. (Carnegie endowment for international peace).

Early days on the Yukon, by William Ogilvie. Ottawa, Thorburn and Abbott, 1913. 306 p. il.

Esquisse d'une histoire du régime agraire en Europe aux XVIIIe et XIXe siècles, par Henri See. Paris, Marcel Giard et cie, 1921. 276 p.

Jahrbuch fur wissenschaft und praktische tierzucht, Vol. 14, 1921. Hannover, Schaper, 1921. 368 p.

Schomllers jahrbuch fur gesetzgebung, verwaltung und volkswirtschaft im deutschen reiche, Vol. 46, 1922. Munchen, 1922. 316 p.

House decorations and repairs, by William Prebble. Toronto, Sir Isaac Pitman & sons, ltd. 1922. 114 p. il.

Designs for a three teacher rural school with teachers' cottage, New York, White pine bureau, 1921. 24 p. il.

Elementary electric wiring, by B. B. Burling and A. M. Karweik. Milwaukee, Wis. Bruce publishing co. 1921. 56 p.

Practical wireless telegraphy, by E. E. Bucher. New York, Wireless press, inc. 1921. 336 p. il.

The economic basis of politics, by C. A. Beard. New York, A. A. Knopf, 1922. 99 p.

Trail craft, by C. P. Fordyce. Cincinnati, Stewart, Kidd co. 1921. 202 p. il.

Standard wiring for electric light and power by H. C. Cushing, Jr. New York, published by the author, 1921. 399 p. il.

Experimental wireless stations, by P. E. Edelman. New York, N. W. Henley publishing co. 1922. 392 p. il.

Radio-telephony for everybody, by L. M. Cockaday. New York, F. A. Stokes co. 1922. 213 p. il.

The elements of refrigeration, by A. M. Greene. New York, John Wiley & sons, 1919. 472 p. il.

Boys' home book of science and construction by A. P. Morgan. Boston, Lothrop, Lee & Shepard co. 1921. 458 p. il.

Ropp's farmers' reckoner. Chicago, C. Ropp & sons. 128 p.

Elementary home economics, by M. L. Matthews. Boston, Little, Brown & co. 1922. 343 p. il.

A manual of hygiene and sanitation, by S. Egbert. New York, Lee & Febiger, 1919. 554 p. il.

Graded outlines in hygiene, by W. F. Cobb. Yonkers-on-Hudson, World book co. 1922. 214 p.

The newer knowledge of nutrition, by E. V. McCollum. Toronto, Macmillan co. of Canada, 1922. Revised edition. 449 p. il.

Health education and the nutrition class, by J. L. Hunt, B. J. Johnson and E. M. Lincoln. New York Bureau of educational experiments, 1921. 279 p. il.

Social problems, by Anna Stewart. New York Allyn & Bacon, 1917. 233 p.

Society and its problems, by G. S. Dow. New York, T. Y. Crowell co. 1920. 594 p.

Taxation, by C. B. Fillebrown. Chicago, A. C. McClurg & co. 1914. 163 p.

Civic science in the community, by G. W. Hunter and W. G. Whitman. New York, American book co. 1922. 430 p. il.

The community, by E. C. Lindeman. New York, Association press, 1921. 222 p.

New churches for old, by J. H. Holmes. New York, Dodd, Mead & co. 1922. 341 p.

The fiscal and diplomatic freedom of the British oversea dominions, by Edward Porritt. Oxford, Clarendon press, 1922. 492 p. (Carnegie endowment for international peace).

Timber, by Harold Titus. Boston, Small, Maynard & co. 1922. 379 p.

NEW PUBLICATIONS

DOMINION DEPARTMENT OF AGRICULTURE

Division of Botany.—Interim Report of the Dominion Botanist, H. T. Gussow, for the year ending March 31, 1922. Dominion Experimental Farms.

Tobacco Division.—Interim Report of the Officer in Charge, F. Charlan, for the Year 1921. Dominion Experimental Farms.

New Varieties and Selections of Grain Originated on the Dominion Experimental Farms.—By Chas. E. Saunders, B.A., Ph.D., LLD., F.R.S.C., Dominion Cerealist. Bulletin No. 11—New Series.

The Canadian Record of Performance for Pure-Bred Dairy Cattle.—Report No. 14. Regulations, Standards and Records of Cows Qualified for Registration. Live Stock Branch.

Why and How to Use Skim-Milk.—Circular No. 5. By Helen G. Campbell, Dairy and Cold Storage Branch.

Why and How to Use Cream.—Circular No. 6. By Helen G. Campbell, Dairy and Cold Storage Branch.

Why and How to Use Cottage Cheese.—Circular No. 7. By Helen G. Campbell, Dairy and Cold Storage Branch.

Why and How to Use Buttermilk.—Circular No. 8. By Helen G. Campbell, Dairy and Cold Storage Branch.

The Branding or Marking of Cheese and Butter Boxes.—Circular No. 9. Dairy and Cold Storage Branch.

Dehorn Your Commercial Cattle.—By P. E. Light, B.S.A., Dominion Live Stock Branch, and G. B. Rothwell, B.S.A., Dominion Animal Husbandman. Pamphlet No. 15—New Series.

The Root Vegetables Act, 1922.—Acts, Orders and Regulations No. 3. The Fruit Branch.

ONTARIO

Women's Institutes.—Report of 1920 and 1921.

Horticultural Societies, 1921.—Sixteenth Annual Report.

Debates, Plays and Community Music for Rural Social Organizations.—By O. J. Stevenson, M.A., D.Paed., Professor of English, Ontario Agricultural College. Special Bulletin.

Sweet Clover.—Circular No. 41. By W. J. Bell, B.S.A., Principal, and E. K. Hampson, B.S.A., Field Husbandry Department, Kemptville Agricultural School.

Mixed Farming in the Ontario Corn Belt and Mixed Farming and Apple Orcharding in Ontario.—Bulletin No. 288. Farm Management Series, Part 5. Ontario Agricultural College.

QUEBEC

Lime and Pulverized Limestone.—Their Employment as Soil Correctives in the Province of Quebec.—By Professor H. M. Nagant, I.A.I.F., Oka Agricultural Institute. Bulletin No. 76.

Quebec Society for the Protection of Plants, 1921-22.—Fourteenth Annual Report.

MANITOBA

Department of Agriculture and Immigration.—Annual Report for the Fiscal Year ending November 30, 1921.

Manitoba Flora.—Check List with Notes. Botany Department, Manitoba Agricultural College, 1922.

SASKATCHEWAN

Twelfth Annual Report of the Director of Agricultural Extension.—On the work of the Agricultural Societies of Saskatchewan during the twelve months ended April 30, 1922.

Co-operation and Markets.—Eighth Annual Report of the Commissioner for the twelve months ended April 30, 1922.

BRITISH COLUMBIA

Sixteenth Annual Report of the Department of Agriculture, 1921.

Yields, Grades, Prices and Returns for Apple Varieties in the Okanagan Valley.—By W. A. Middleton, B.S.A., Extension Assistant, College of Agriculture. Agricultural Department Bulletin No. 90.

Small Fruit Survey.—A Report on the Cost of Growing Strawberries and Red Raspberries in Certain Coast Sections of British Columbia during the season of 1921. By A. F. Barss, A.B., B.S. in Agr., M.S., College of Agriculture. Agricultural Department Circular No. 39.

Dairy Farm Survey.—Report on One Hundred and Twenty-four Farms in the Arrow Lakes, Chilliwack, Courtenay, Ladner and Salmon Arm Districts. By H. R. Hare,

B.S.A., Extension Assistant, College of Agriculture. Agricultural Department Bulletin No. 91.

Peat and Muck Soils.—By Wm. Newton, Chief Soil and Crop Instructor. Agricultural Department Circular No. 39.

Varieties of Fruit Recommended for Planting in British Columbia.—Circular No. 64 (New Horticultural Series).

British Columbia Fruit-Growers' Association.—Thirty-second Annual Report for the year ending December 31, 1921.

MISCELLANEOUS

The Province of Saskatchewan—Its Development and Opportunities.—By F. H. Kitto, D.L.S., A.M.E.I.C. Prepared under the direction of the Superintendent, Natural Resources Intelligence Branch, Department of the Interior.

The Hereford Herd Book.—Volume 13 of the Canadian Hereford Herd Book contains the pedigrees of cows and bulls numbered 41,228 to 44,334.

The Aberdeen-Angus Herd Book.—The Canadian Aberdeen-Angus Herd Book, Volume 6, contains the pedigrees of bulls and cows numbered 22,870 to 29,699.

Live Stock and Animal Products Statistics, 1921.—Issued by the Internal Trade Branch, Dominion Bureau of Statistics. Prepared in collaboration with the Department of Agriculture, Canada.

PART V

The International Institute of Agriculture

FOREIGN AGRICULTURAL INTELLIGENCE

All communications in regard to this section should be addressed to T. K. Doherty, International Institute Commissioner, Department of Agriculture, West Block, Ottawa.

SCIENCE AND PRACTICE OF AGRICULTURE

CROPS AND CULTIVATION

1093.—**The Effects of Liming on the Availability of Soil Potassium, Phosphorous and Sulphur.**—PLUMMER, J. K., in *Journal of the American Society of Agronomy*, Vol. 13, No. 4, pp. 162-171, bibliography of 21 publications. Lancaster, Pa., Apr. 1921.

A discussion dealing with the important question of the effects of liming on the availability of soil potassium, phosphate, and sulphur.

The more recent research, embodying laboratory extractions with weak solvents, pot studies using a variety of plants as indicators of the concentration of the soil solution in potassium and the analyses of their ash, lysimeter experiments by which the production of potassium has been measured, and field tests, has failed to show that basic compounds of calcium and magnesium increase, by chemical action, to any practical extent, the availability of the soil store of native potassium.

More research needs to be carried out before we can say that additions of lime will reduce the necessity of applying soluble phosphates to the soil. As measured by yields, phosphates of iron and aluminum seem to be as available as calcium phosphates. It is very probably true that fixation of phosphatic fertilizers by colloidal absorption induced by iron and aluminium oxides is responsible for the failure of some crops to respond to phosphorous additions. Additions of lime to such soils undoubtedly flocculate some of these colloids, thus giving the soils a better physical condition for plant growth. Additions of lime before and after applications of soluble phosphates, have greatly increased the efficiency of the phosphatic fertilizer. When insoluble calcium phosphate has been applied, it seems that applications of lime have reduced the effectiveness of the phosphate in the majority of cases.

The scant data of lysimeter experiments only, which deal with the question of sulphate availability or conservation, seem to show that liming with small amounts of lime, both small and large amounts of magnesia, magnesium carbonate, limestone, dolomite, and magnesite, increases the solubility of native soil sulphate. Heavy applications of lime for a few years at least, apparently reduce this loss of sulphur from the soil.

Influence of Fallow vs. Stable Manure.—PFEIFFER, T., in *Landwirtschaftliche Versuchs-Stationen*, Vol. 98, No. 3-4, pp. 187-222. Berlin, 1921.

It is concluded that a well-established action of fallow tending to increase crop yields is exceptional, and occurs only under special and unusual conditions. The results obtained could not more markedly indicate the insignificance of fallowing in connection with favourable influences on the nitrogen content of soil, and showed the probability of losses of available nitrogen during fallowing by leaching.

The results of the studies with stable manure emphasized the importance of the residual action of manure in soil, which it is concluded is much better in many cases than average results would indicate. These results are also taken to indicate that stable manure is the best material for maintaining the so-called original strength of the soil.

Studies of the nitrogen balance of the soil as influenced by the factors tested showed that the decrease in the total nitrogen content of the soil was greater under the legume rotation than under the fallow rotation, but that the increase in the nitrogen content of the total crop from each rotation was the same. This is taken to indicate the greater value of the nodule bacteria of legumes than of the free living nitrogen-fixing bacteria of fallow for nitrogen fixation. The rotation including stable manure treatment had the most favourable influence on the nitrogen balance of the soil, this being attributed to the residual action of the manure.

The Fertilizing Action of Carbon Dioxide.—GEHRING, A., in *Fuhling's Landwirtschaftliche Zeitung*, Vol. 70, Nos. 7 and 8, pp. 137-153; 9-10 pp. 181-197. Stuggart, 1921.

The author brings together the results of a number of studies on the production of carbon dioxide in soils by organic fertilizers, such as guanol, and its influence upon crop growth.

It is first shown that guanol exhibits a degree of decomposition of its organic constituents corresponding to that of the most mature peat. The peat used in the manufacture of guanol is not only a fertilizer carrier but exercises an important fertilizing action. It was found in laboratory experiments that both guanol and stable manure in normal applications increase the carbon dioxide production in the soil. When plants were grown under glass on soil so treated they showed a more intense green colour than untreated plants, and were more resistant to external injurious influences.

It is concluded that carbon dioxide fertilization in the form of humus additions to soil is a practical possibility of considerable importance, and that guanol, on account of its content of decomposed peat in addition to its mineral nutrient content, is an actual fertilizer of this nature. It was also found that carbon dioxide fertilization of grain crops with guanol increased the ratio of grain to straw. Further studies showed that liming caused an unmistakable action of carbon dioxide, both in soils which are unfertilized and in soils which have been fertilized with organic matter.

Science and Crop Production.—RUSSELL, E. J., in *Nature*, Vol. 108, No. 2708, pp. 116-120. London, 1921.

This is an abstract of a farmers' lecture of the British Association delivered at Edinburgh, in which a review is given of studies conducted at the Rothamsted Experimental Station on the use of manure and fertilizers in relation to crop production. The summarized results of long-time experiments are taken to indicate that it is only a first approximation to say that artificial fertilizers are equally as good as barnyard manure. It is pointed out that barnyard manure produces effects of the highest importance to the land which no known combination of artificial fertilizers will bring about.

It is shown that barnyard manure differs in two ways from artificial manures. The variation in yield from year to year is diminished by the use of barnyard manure, as is also the deterioration in fertility due to continuous cropping for a period as long as 80 years. On the other hand, tests with at least 15 different combinations of artificial fertilizers have shown that the results fluctuate considerably from season to season and deteriorate as the years pass by. Barnyard manure never did badly even in the worst seasons, but it did not yield record crops even in the best seasons.

The deterioration in yield from plats treated with artificial fertilizers has been marked, especially on the wheat and barley plats, and has been greatest where one of the essential fertilizer constituents was witheld. General means of improving crop production are discussed.

Investigations on the Hardening Process in Vegetable Plants.—ROSA, J. T., in *Missouri Agricultural Experiment Station, Research Bulletin* 48, pp. 5-90. Columbia, 1921.

This study was undertaken as one of the phases of a project on the transplanting of vegetable plants, and since the hardening process resulted in a condition of acquired hardiness, the experiments are believed to throw considerable light on the general problem of cold resistance in plants. Cabbage was used as a representative type of plant which is capable of being hardened so as to withstand considerable ice formation within the leaves, and the tomato was used as the representative of a type of plant which can not be so hardened as to withstand ice formation. Lettuce, cauliflower, kale, celery, peppers, eggplants, and sweet potatoes were other plants investigated.

The data show that the hardening process in plants is accompanied by a marked increase in water-retaining power, and that this water-retaining power is due chiefly to the imbibitional forces of the cell. The amount of water frozen in hardy plants is less than in tender plants, and cells of hardy plants were found to retain a larger amount of unfrozen water than those of tender plants. It is believed that cold resistance in plants is due to the increased water-retaining power of the cells, and the increased water-retaining power is associated with increased moisture content, increased amount of hydrophilous colloids, such as pentosans, increased water-retaining power of such cell colloids, and increased amount of osmotically active substances as soluble sugars. The marked parallelism between pentosan content and hardiness is believed to indicate a causal relationship, although the pentosan content alone can not be taken as an absolute index of cold resistance. Salt content, acidity, hydrogen-ion concentration, sugar, moisture, protoplasmic colloids other than pentosans, etc., may influence water-retaining power and hardiness.

It is believed that the fundamental difference between hardy and tender species lies in their ability to initiate changes whereby the stability, and water-retaining power of the protoplasm and consequently hardiness are increased. Hardy species and varieties

are said to possess the ability to initiate such changes to a greater or less great degree, while tender species possess it to a very slight degree or not at all.

In view of the connection between cell water-retaining power and hardiness which has been found and the correlation between soluble pentosan content and hardiness, it appears that selection of plants for high soluble pentosan content may be helpful to the breeder of cold-resistant, drought-resistant, or disease-resistant varieties of crop plants.

1101.—The Intensity of the Green Colour as a New Factor to be Taken Into Account in Wheat Selection.—Westermeier, Kurt, in the *Zeitschrift fur Pflanzenzuchtung*, Vol. VIII, Part I, pp. 14-25. Berlin, March, 1921.

Chlorophyll is a fundamental factor in all the physiological processes leading to increase of substance, and since the chief aim of all breeding work connected with agriculture is to increase the yield, the study of chlorophyll from the genetic standpoint is of paramount importance.

The author's experiments were carried out on the following varieties and kinds of wheat:—

Winter Wheat.—*Triticum vulgare:*—Naussauer Milchweizen, Kladener Altmarkischer Braunweizen, Crievener 104. Siebenburger gefleckt, Strubes Squarehead.

Triticum turgidum: Wohltmanns Schwarzer Bartweizen, Wohltmanns Weisser Bartweizen, Kirsches fruher Grannenweizen.

Triticum capitatum: Cimbals Geheimrat Wohltmann.

Spring Wheats.—*Triticum monococcum vulgare, T. dicoccum seringeanum album, T. Spelta Arduini, Triticum polonicum, R. durum.* (Durum wheat and Portuguese Lebeiro), *T. vulgare* (Bielokoloska, Svalofs Perl; Rapado de espica blanca, Rimpaus Roter Schlanstedter, etc.). *Triticum compactum* (Mocho de espica quadrata, Igel and Binked). *T. turgidum* (Ontario, Utah, Branco).

The author studies the connection between the different metabolic processes and the development of chlorophyll as shown by a scale of colours based on two fundamental colour schemes: 96 green mottled with yellow, and 92 (decided green).

The following results have been obtained:—

A. *Effect on the Plant of Chlorophyll* Development.

I.—The plants of the *vulgare* form, colour 96;

(a) In the first stages, grow more slowly the deeper the colour.

(b) The reverse occurs at the time of heading, the darker plants developing more rapidly.

(c) The dark types head earlier than the light.

(d) The total growth period of the dark types is longer than that of the light.

II.—The plants of the *vulgare* form colour 92, have, as has been said, a shorter growth period, they develop slowly until the heading stage, but from that time, the process is accelerated (until the stage when growth ceases), as if the chromatic type 92 was able to turn the solar energy to better account.

III.—The same occurs both with the *compactum* and *vulgare* forms.

IV.—The dark *turgidum* forms first grow quicker than the light forms, and it is only at the flowering season that they are outdistanced by the latter, which have altogether a longer growth period (thus differing from *vulgare*).

V.—The light types flower later.

VI.—The darker the colour, the less is the foliage in proportion to the length of the culm. There is thus, economy of leaf-surface.

VII.—The development and tone of the leaves influence the culm length, which increases with the intensity of the colour. The same applies to the thickness of the culms.

B. *Effect of Chlorophyll on the Grain:* I.—The weight of kernels per ear, the content of nitrogenous substances, of dry matter and ash increase as the green of the vegetative parts becomes deeper.

II.—With greater intensity of colour, the proportion of nitrogenous substances to dry matter increases with growing rapidity, though the dry matter content itself tends to rise.

III.—The proportion of nitrogen free substances to gluten decreases with the intensity of the colour.

IV.—The same colour shade may have different effects upon different varieties of wheat.

Rust Resistance in Winter Wheat Varieties.—Melchers, L. E., and Parker, J. H., in *United States Department of Agriculture, Bulletin* 1046, pp. 32. Washington, D.C., 1922.

Field experiments to determine the resistance to black stem rust (*Puccinia graminis tritici*) of about 100 varieties and strains of winter wheat, many of them pure-line selections, and of a few varieties of spring wheat, were conducted in a rust nursery at Manhattan, Kansas, in 1915, 1916, and 1917. Greenhouse experiments were conducted during the winter of 1916-17, using the same varieties. Special methods were developed for producing rust epidemics under the prevailing climatic conditions of Kansas.

In the rust nursery severe epidemics were produced each season, and the percentage of rust infection probably represented the maximum rust attack which the varieties would encounter under field conditions.

All the winter-wheat varieties grown were found to be susceptible to stem rust except Kanred and two very similar pure-line selections, P1066 and P1068. These three varieties were found to be resistant. Another pure-line strain, Kansas No. 2390, gave evidence of being partially resistant.

Plumpness of kernels usually is reduced by severe rust attack. The three resistant varieties produced grain of good quality in 1916 and 1917, when other varieties grown under the same conditions but much more severely rusted produced very badly shrunken kernels.

Several varieties of spring wheat proved rust resistant under the conditions of these experiments, though the Black Persian was the only spring-wheat variety of the common or bread-wheat group (*Triticum vulgare*) which was found to be resistant. Of the varieties of durum or macaroni wheat (*Triticum durum*), Beloturka (C. I. No. 1513), Iumillo (C.I. No. 1736), Kubanka (C.I. No. 2094), Monad (D-1), and Pentad (D-5) showed definite signs of resistance to stem rust. A hybrid of Iumillo x Preston, resembling the durum parent, also was found to be rust resistant. All of the strains of emmer and einkorn grown gave some evidence of resistance.

In the greenhouse experiments the plants were studied for rust resistance at two stages of growth, viz., as seedlings and at the time of heading. The results were very similar to those in the field experiments. All the winter-wheat varieties were susceptible except three—Kanred, P1066, and P1068. Kansas No. 2390, which appeared to be somewhat resistant in the field, showed no evidence of resistance at either stage of growth in the greenhouse. Most of the spring-wheat varieties which the field experiments had shown to be resistant also gave more or less evidence of resistance under greenhouse conditions. This was not true, however, of einkorn.

Although the results obtained in the field and those in the greenhouse agree fairly well, final conclusions as to rust resistance of a variety should not be drawn from greenhouse tests alone. The combined evidence from nursery experiments and inoculations of seedlings and of plants in the heading stage under greenhouse conditions is much more likely to agree with actual field trials, which must always be the final test of the practical value of any variety.

The behaviour of the rust parasite on the inoculated plants of the three resistant varieties—Kanred, P1066, and P1068—seems to be different from that in other varieties described as resistant. In most other varieties prominent flecks are nearly always present in 8 to 12 days after inoculation, and most frequently small uredinia are produced. In these three varieties, however, flecks are very rarely visible, and in no instance have even the most minute uredinia been observed.

Reports from Alabama, California, Illinois, Iowa, Missouri, Nebraska, New York, Wisconsin, and New South Wales indicate that these three varieties are resistant to stem rust; but Minnesota and South Dakota report them rather severely attacked by stem rust. The occurrence of distinct strains of stem rust complicates the problem of predicting what their behaviour may be during different seasons. Present knowledge of the distribution of stem-rust strains and whether they occur each season in definite regions is so limited that the resistance or susceptibility of these wheats in any region may differ from season to season.

The very light infection of leaf rust in sowings made in Alabama, Arkansas, California, Missouri, North Carolina, North Dakota, Oregon, South Dakota, Tennessee, Texas, Virginia, and Wisconsin, and in New South Wales has proved that these three varieties are extremely resistant to leaf rust also. Present knowledge of the leaf-rust problem indicates rather definitely that these varieties will maintain this high degree of resistance under a wide range of conditions.

Kanred, one of the three rust-resistant pure lines, has an unusual combination of desirable characters. In Kansas it yields from 3 to 5 bushels more per acre than either Turkey or Kharkof, the varieties commonly grown. It ripens a little earlier, thus escaping some of the damage from drought and hot winds during the ripening period. Kanred also seems to be more winter hardy in Kansas than other varieties and survives the severe winters with less loss from winter killing. In milling and baking quality it apparently is equal to Turkey and Kharkof, varieties of hard red winter wheat which have established a world-wide reputation for quality.

Experiments and the experience of large numbers of farmers have shown that Kanred is adapted to other sections of the hard winter-wheat area, and it is now rapidly being introduced and widely grown in Oklahoma, Texas, Nebraska, eastern Colorado, and some other States.

Kanred wheat is believed to have considerable potential value also as a parental variety to be used by plant breeders in combining its rust resistance and other valuable characters with those of the varieties of other classes of wheat adapted to the several wheat-growing districts.

1110.—Comparison Studies of the Resistance to Lodging of Several Pure Bred Wheat Varieties.—DRAGHETTI, A., in *Le Stazioni*

Sperimentali agrarie italiane, Vol. LIV, Pts. 4-6, pp. 145-180. Bibliography of 21 works. Modena, 1921.

For general purposes it is possible to distinguish at least three characteristic forms of lodging, to be attributed: (1) to excess of nitrogen; (2) to weather conditions; (3) to a lack of uniformity of the stem.

Practical experience has led to the classification of the varieties most liable to lodging, even under normal conditions; it is therefore possible to make a distinct classification of wheat varieties. This may be attributed to the fact that different types present marked and constant differences as regards the equilibrium of the stem. For this reason it is possible to make investigations with a view to the discovery of the weak side of their morphological structure.

The author was not content to rely on empirical observations for the investigations described in minute detail in the present article, but rather on the statistical biometric method by which means he aimed at the solution of the following problems.

(1) To find a positive or negative value attributable to different varieties, under fixed biological cultural conditions in order to facilitate the establishment of a rational gradation with respect to lodging;

(2) To find and evaluate the positive and negative characters which should serve as a guide in selection work;

(3) To trace the outline, from the statistical standpoint of a typical plant free from the inferior qualities associated with the breed.

A selection of varieties of cultivated wheats was made with a view to conducting comparative adaptation trials at the Experiment Farm at the Forli Agricultural Station, on clay loam, following on beets; the ordinary fertilizers and cultural operations being in every case employed.

For each stem the author determined (from May 10 to 20): (1) weight; (2) height to top of ear; (3) height from centre of gravity, taking into account the influence exercised by the varying lengths and thickness of the upper leaves; (4) length, weight, diameter and thickness of the epidermis of each internode; (5) weight, in grammes, determining the break due to bending of the lower portion of each internode and for a bract of 10 cm.; (6) submission to bend up to limit of breakage in cm., and angle of inflexion in degrees. For determinations (5) and (6), the author has invented an apparatus which is described and illustrated.

The biometrical data obtained serve as a basis to estimate the mean and to deduct the coefficients of variability by applying the Gauss formula.

In this way a marked positive correlation has been established between the unit weight of the internode and its resistance to bending.

The data obtained concerning the average degree of bending of 10 varieties studied, permit the conclusion that a characteristic elasticity exists for each and this factor is a point of considerable importance. As a matter of fact, their progressive value is in perfect correlation with the gravity of lodging observed in the plots concerned, for example:

Inflexion, First Internode	Cultural Observations
4·8 a 5·9 cm.....	Stems completely resistant.
7·3 a 8·0 "	" partly liable to lodging.
8·8 a 9·0 "	" completely beaten down.

Flexibility of stems is therefore a character which should be taken into consideration as much from the practical (comparatively thick sowing) as from the experimental point of view.

Formulae have here been established, criticized and developed, relative to the calculation of moments of inactivity, of resistance and of unit coefficients of breakage; this is followed by observations with reference to the intrinsic of local mechanical factors: (a) pressure due to the force of the wind; (b) pressure due to the displacement of the centre of gravity from the vertical; (c) pressure due to adhesive raindrops. Determinations are made as to the statistical equilibrium and the balance between positive and negative pressure of the stem and an examination of the differential mechanical characteristics attached to the varieties studied.

Taking the "index of resistance of lodging" to indicate the relationship between the pressure of resistance and the pressure of flexion for each variety, in such manner that the equilibrium be represented by unity, the positive resistance by a number superior to 2 and the negative resistance by a value inferior to unity, the following values will be obtained: Rieti fam. 11: 1·026—Gentil rosso fam. 48: 1·002—Cologna fam. 12: 0·881—Inalletabile fam. 38: 1·232—Caro: sello fam. 91: 1·052—Marsolino fam. 33-0·981—Coronation: 1·309—Apulia: 0·818—Luigia Strampelli: 0·950—Dauno: 0·877.

Supposing that the more forcible pressures of total resistance or total deflection be taken as equal to 100, the author calculates that this may be sub-divided into 3 part time pressures due to wind, to displacement of centre of gravity and adhering raindrops. The results are shown in tabular form, and permit the following conclusions:—

(1) That the force which is the chief cause of distorted development even for

varieties with a very flexible stem, is in all cases the wind, which possesses an influence coefficient varying from 64·3 to 83·7% for total deflection.

(2) That the sum of the coefficients of wind effect and displacement of centre of gravity is very nearly constant, i.e., the coefficient of wind effect is inversely proportional to stem flexibility, whilst the coefficient of effect of deviation from the centre of gravity is directly proportional to it.

But these relations have only an approximate value; the only one having any absolute and specific value is that arising from the results of comparison of the index numbers concerning moments of resistance and total deflection.

The statistical ratio of the stem is given in the article. The results obtained recently are very encouraging as to the possibilities of arriving at the solution of the problem of lodging and increase in yield.

Seed Production in Red Clover.—SCHLECHT, F., in *Zeitschrift fur Pflanzenzuchtung*, Vol. 8, No. 2, pp. 121-157. Berlin, 1921.

The investigations reported concerned self and close-pollination of red clover, the activities of bumblebees and honey-bees as red clover pollinators, and observations on other factors involved in seed production in this crop.

Spontaneous self-fertilization of red clover is not considered possible. Artificial self-pollination or the use of pollen from flowers on the same head was fruitless, and inter-pollinating plants propagated vegetatively by root division did not generally give more seed than pollinating within the same plant. Pollen tubes ranged from 5·2 to 11 mm. in length, averaging 8·71 mm. with the largest heads generally containing the longest tubes. The tubes in the second cutting were somewhat longer than in the first, probably due in part to climatic conditions and soil fertility. A retrogression was noted in the third cutting.

Fertilization by honeybees under gauze enclosures was about 4·5 per cent greater than occurred in plants in the open. Honeybees appeared to be better pollinators than bumblebees in large gauze cages, as they did not break out and the pollen was practically pure. Single bees in small cages failed to pollinate.

Contrary to observations of Martin, high atmospheric humidity showed only a slight influence on seed production. Both seed cells in the ovary were found able to mature seed, but pods with one seed were far more prevalent. Seed from double pods were smaller as a rule, and about one-fifth lighter in weight than those from single pods. While double seed pods contained more shrivelled seed, striking differences in germinability, were not observed.

A plant disease, *Botrytis antherarum trifolii*, which completely destroys the anthers of red clover, is described.

Methods of Winter Wheat Production.—COLE, J. S., and HALLSTED, A. L., in *United States Department of Agriculture Bulletin* 1094, pp. 31. Washington, D.C., 1922.

The Fort Hays branch station is located in Ellis County, Kansas. This county is in the western tier of the solid block of "million-bushel" wheat counties in that State. Statistics of the Kansas State Board of Agriculture show that the agriculture of this section has been stabilized for 30 years by devoting nearly three-fourths of the cultivated acreage to winter wheat. The statistics also show that during this period there has been no change in yields. The average yield of Ellis County for the 30 years from 1891 to 1920, inclusive, is only 9·6 bushels per acre.

The statistics of crop acreage show that if every acre in other crops were seeded to wheat it would still be necessary to sow approximately two-thirds of the wheat following wheat. About one-half of the other third, or one-sixth of the total wheat acreage, might be sown following corn, and the other sixth following miscellaneous crops, chiefly grain and forage sorghums. The greatest cultural problem in terms of acres involved, consequently, is how to prepare wheat stubble for wheat.

Results of experiments in methods of wheat production conducted co-operatively at the Fort Hays branch station are available for the 14-year period from 1907 to 1920, inclusive.

During this entire period wheat has been grown continuously after wheat by several methods of cultivation. There are 90 days between harvest and seeding. Late ploughing, 73 days after harvest and 17 days before seeding, has averaged 10·5 bushels per acre. This is the lowest yielding method under trial, but is practically the same as the Ellis County average of 10·2 bushels for the same period. Early ploughing, 32 days after harvest and 58 days before seeding, has averaged 14·6 bushels per acre. Early ploughing subsoiled has averaged 17 bushels, and land listed instead of early ploughed has averaged 17·3 bushels. Land alternately fallowed and cropped to wheat has averaged 20·3 bushels.

During the 7-year period from 1914 to 1920, inclusive, surprising success has attended the growth of wheat sown in wheat stubble either disked or uncultivated. This method has averaged higher yields than late ploughing and nearly as much as early ploughing.

The results of the experiments show the possibility of increasing the county average.

Land that can be early ploughed or listed can not be fallowed profitably, although the yield per acre might be increased somewhat. Land that can not be prepared early could be fallowed more profitably than ploughed late and seeded. If free from perennial weeds or grasses it could still more profitably be seeded in the stubble, with no preparation unless perhaps a double-disking.

Studies of the method of fallow and the length of fallow season show that the effectiveness of fallow is not increased at this station by cultivation for a longer period than the growing season of the fallow year. The greater part of its benefits may be realized by cultivation in the period between harvest and seeding. The essential factor of the fallow is the maintenance of a bare surface, prevention of the growth of vegetation. The cultural methods by which this is accomplished are of minor importance from the standpoint of resultant yield. Their importance is in their relative cost and their effectiveness in preventing soil blowing.

Green manures, although more expensive, do not increase yields over bare fallow or even over early ploughing of land from which a crop is harvested.

The results of experiments with sod crops in rotations show them to be relatively unsuccessful themselves. Alfalfa is more successful than brome-grass, but is very depressing in its effect upon following crops. Wheat after corn averages about the same as the better methods of wheat after wheat. Kafir produces heavier yields of both grain and forage than corn, but wheat can not be sown immediately after kafir without great reduction in yield. The depressing effect of kafir is, however, eliminated by a single year of fallow or cropping. Barley, which is spring sown, follows kafir as well as it does other crops and produces relatively good yields. Winter wheat follows barley as well as it does wheat or other crops. This establishes in the rotation a place for barley between kafir and winter wheat.

The use of barnyard manure at different rates and in different positions in 3-year rotations of kafir, fallow and winter wheat for the 8-year period from 1913 to 1920, inclusive, has not had a measurable effect upon the yields of either wheat or kafir.

The experiments do not indicate that a reduction of the proportion of wheat to other crops would necessarily result in an increased average yield per acre of wheat. They do indicate, however, that the present average yield per acre is not as high as it should be. The most fertile field for the control of yields is the 90-day period between harvest and seeding. The more completely this is made a cultivation period the higher will yields rise above the minimum at which they now rest. An increase of 50 per cent is not impossible, and some part of it should be realized through greater timeliness and efficiency of operations.

1117.—Bromus Brachyantheca, a Brazilian Winter Forage Plant.—De Arruenda, J. M., in *Chacaras e Quintaes*, Vol. XXIV, No. 2, pp. 97-98. Sao Paulo, August 15, 1921.

For the last five years, the author has been growing in the State of Santa Caterina, Brazil, a *Graminea* for winter forage at an altitude of 4,000 feet. The plant, which he found wild in his fields, has been identified by Dr. Kuhlmann (Agrostologist), as *Bromus brachyantheca* Doell. The author states that this grass is resistant to cold, and that he is well satisfied with the good crops he has obtained.

LIVE STOCK AND BREEDING

1132.—Current Ideas Respecting the Licking Habit in Cattle and Its Causes. Results of Practical Experiments With Drugs in Prussia.—Zuntz, N., in the *Mitteilungen des Vereins Zur Forderung der Moorkultur in Deutschen Reiche*, Year XXXVII, pp. 437-440. Summarized in *Biedermann's Zentralblatt*, Year I, Part 1, pp. 33-34. Leipzig, 1921.

The analogy between the symptoms of the licking disease and those induced by depriving young growing animals of certain constituents of protein, such as tyrosin or tryptophane is, according to the author, so striking, that we are compelled to suppose that the habit of excessive licking in cattle is due to the absence of one or more of the substances necessary for the development of the organism. Further, the grazing experiments made by the author, the success of applying a dressing of sodium nitrate to the pastures, and the fact that the aftermath suited the animals better than the first cutting of hay, all suggested that the trouble was due to a deficiency of protein.

As is well-known, only a portion of the plant protein consumed enters into the formation of animal protein.

The richer the forage in protein, the easier becomes the elimination of the constituents which are not used in metabolism. Further, in many cases, the real remedy for the licking disease may consist, on the one hand, of increasing the absolute amount of protein, and on the other, of giving protein of a different composition by altering the botanical constituents of the forage, or the fertilizer, or using forage of a different quality, viz., at different stages of growth. The drying of the forage may also have some effect, seeing that under natural conditions certain components are washed out by the rain, and that the action of the sun produces chemical changes affecting some important substances present in fresh grass.

The author, after a consideration of all the data referring to the licking disease, and the conclusions that may be drawn from them, recommends the following prophylactic measures:—

(1) Care should be taken that sodium should not be lacking in the forage. The rest of the mineral constituents should form a basic mixture containing 600 to 750 mgm. of alkali equivalents.

(2) The protein content of the ration ought to be increased by the addition of concentrates rich in protein (linseed cake, palm-oil cake) suitable for ruminants.

(3) Hay must be made of the youngest grass possible; this has recently been advised by Neubauer, as the best means of remedying the lack of protein in forage intended for growing stock.

(4) In conclusion, the author lays great stress on the necessity of further experiment to determine whether the good effect of sodium nitrate observed by him is to be attributed to the sodium, or the nitrogen. In order to do this, one plot must be manured either with sodium chloride, or with sodium sulphate, at the rate of 780 to 1170 kg. per hectare, whilst another plot is manured with ammoniacal salts. During the execution of his experiments, the author still believed in the efficacy of the sodium in the sodium nitrate, but is now inclined to ascribe the favourable effect to the nitrogen content of the forage.

The author considers that ordinary drying causes the loss of certain indispensable substances; the truth of this opinion should be tested by comparing the products of the usual drying methods and those obtained by ensilage, or a modern drying process entailing the minimum loss of nutrient substances.

The Sunflower as a Silage Crop.—VINALL, H. N., in *United States Department of Agriculture, Bulletin* 1045, pp. 32. Washington, D.C., 1922.

In regions where the temperatures during the growing season are relatively low, and corn and sorghum do not produce heavy yields, the sunflower is recognized as an extremely valuable silage crop, and the acreage devoted to its production is increasing rapidly. Sunflowers have been found to be much more resistant to frost than corn. The best yields are obtained on rich clay loams well supplied with humus, but the crop has been grown successfully on sandy soil in Northern Michigan. Sunflowers will thrive on any soil which will produce a good crop of corn.

The same treatment of the soil that prepares the surface for corn planting will answer for sunflowers. The ground is usually ploughed in the spring and worked down with a spike-tooth harrow, or if fall ploughed it can be put in condition for planting by disking in the early spring. Date-of-seeding tests indicate that sunflowers may be sown at the same time as the farmer plants corn.

It is considered best to cut the crop before the seeds have reached the hard dough stage. Most writers advise harvesting sunflowers for silage when only 50 to 60 per cent of the plants are in bloom. In dry climates the plants can be harvested at an earlier stage of maturity than in humid climates.

The ordinary silage cutter can be used for sunflowers, but one with a wide throat is desirable in order to accommodate the large heads. The knives should be adjusted to a quarter-inch cut and bolted on the cutter securely. Little trouble will be experienced in cutting sunflowers if the plants are fed into the silage cutter tops first. Sunflower silage packs more easily than corn silage. If the sunflowers are old and somewhat dry it will be necessary to add water along with the silage.

Sunflowers pack much more closely in the silo than corn. This means heavier silage and in large silos results in much greater pressure on the walls. The silo should be watched closely until the settling process is completed. If it shows signs of cracking serious trouble can be averted by reinforcing it with iron bands.

Most feeding experiments indicate that sunflower silage when properly made is equal to corn silage for milk-production purposes. It has also been fed at the Montana station to beef cattle, breeding ewes, and brood sows with good results.

The composition of sunflower silage, as shown by chemical analyses, compares very favourably with that of corn and the sorghums. While somewhat lower in carbohydrates or nitrogen-free extract than the corn and sorghums, it is higher in fat and protein. It is not equal in digestible nutrients to silage made from corn.

Most of the evidence from feeding trials conducted in the United States and Canada leads to the conclusion that even though animals may hesitate at first to eat sunflower silage freely, they soon become accustomed to it, and with the possible exception of corn silage, show no preference between it and other kinds of silage.

Sunflowers have been fed as a soiling crop to dairy cows by a number of experimenters, with good results. The chief disadvantage of this method of feeding is that the plants must be run through a cutter before they are used

1136.—Contribution to Our Knowledge of the Toxic Products of New Hay.—ZCHOKKE, E., in the *Schweizer. Archiv. für Tierheilkunde*, Vol. LXIII, Part 5, pp. 192-202. Zurich, May, 1921.

Although it is well known that new sweating hay sometimes disagrees with

animals, especially horses, the scientific explanation of this fact has so far little foundation. The author, who bases his statements upon Laupper's observations on the spontaneous combustion of hay, concludes that, in new hay, chemical decomposition takes place resulting in the formation of extremely toxic substances. This decomposition is due, in the first place, to the action of enzymes, which on being set at liberty in the drying plant, cause a rise of temperature varying from 40°-45° C.

At this temperature, the conditions are favourable to the growth of many fungi that at once produce actual fermentation. Besides the *Mucorineae* and species of *Aspergillus*, the following micro-organisms also appear:—*Bact. coli*, *Bact. calefactor*, *Oidium lacti*, *Bact. fluorescens liquefaciens*, *Bact. fluorescens non liquefaciens*, *Bact. herbicola aureum*, *Bact. herbicola rubrum*, *Bact. mesentericus vulgatus*, *Bact. mycoides*, *Bact. Zopfii*, *Bact. aerogenes*, *Bact. megaerium*, *Bact. levans* and, especially, the thermophilous species, *Actinomyces Thermophiles*, *Thermomyces lanuginosus*, *and Thermoascus aurantiacus*, which can raise the temperature up to 73° C. During this time, evaporation takes place in the hay, and the water condenses on the cold parts. Probably metals such as iron and manganese, that can act even if only traces are present, bring about, like actual catalysts, oxidation phenomena (raising the temperature to 280°C), thus causing the formation of different new products. It is doubtless the iron which plays the role of fire-carrier and induces the ignition of the heated hay.

The products of this chemical decomposition are volatile compounds, ethereal oils, and although these gradually evaporate and finally completely disappear, while present, they endow the hay with certain toxic properties. The author further mentions a fact showing that toxic products can be formed even in old hay, if it be exposed to great heat. A fire having broken out in a barn, 65 cattle were taken back to the cowsheds some days later. Suddenly 15 of these animals were seized with diarrhoea, drowsiness, violent palpitations of the heart, while eczema made its appearance on their backs, etc. The origin of all these symptoms could be traced to the rain water dripping off the barn after having passed through the heated hay that was even partly carbonized by the fire. The drops falling on the animals' skin caused actual dermatitis, and gave rise to internal troubles when they found their way into the food in the feeding-troughs. Experiment proved that this water had fatal effects upon rabbits and mice.

All the observations made on the formation of these poisonous substances may be summarized as follows:—The quality and quantity of the new products arising in fermenting hay depend on its composition and degree of maturity, the micro-organisms developing in it, and the intensity of the fermentation process.

Since this phenomenon cannot be prevented, the time-honoured precept of never using new hay until three months after it has been made, should be scrupulously obeyed.

FARM IMPLEMENTS

1158.—**The "Maskell Junior Motor Plough."** *The Implement and Machinery Review*, Vol. 46, No. 549, p. 1401. London, January 1, 1921.

The Maskell Junior Motor Plough is especially designed to meet the needs of those who require a smaller outfit than a tractor and a multiple furrow plough, and also those whose system of cultivation demands that operations be conducted in the minimum of space with the greatest possible economy of the headlands.

This machine will plough a furrow 6 to 9 in. deep and 9 to 12 in. wide under ordinary conditions and the adjustments for width and depth are made easily. It is a self-contained single-furrow machine with an over all length of 12 ft., a width of 4 ft. 3 in., a height of 3 ft. 6 in., and a weight of 10 cwt. Steering may be either by handles as the operator walks behind,—a preferable arrangement in difficult working conditions,—or from a detachable driver's seat. The machine can be swung around on its driving wheel, and the same lever which raises or lowers the plough is used to adjust the depth of ploughing as the work proceeds. The outfit is balanced on one large driving wheel, and is supported by an idler wheel on the left side, which acts as a slight drag and gives the plough a tendency to run to the left. This idler wheel is adjustable vertically to run in or out of the furrow. Power is supplied by a fan cooled V. twin cylinder Blackbourn engine giving 10 h.p. on the brake, on petrol. The drive is transmitted to the multiple disc clutch by a chain and by gears from the clutch to the single driving wheel. A pulley drive is supplied for such power work as is consistent with the size of the engine. Cultivating and other tools can be used, while the outfit is made self-steering by a furrow guide wheel.

Manufacturers: Maskell Motor Plough Company, Advance Works, Jews Row, Wandsworth, London, S.W. 19.

AGRICULTURAL INDUSTRIES

1167.—**Non-Alcoholic Wines and Ciders.**—*La Cidrerie francaise*, Year 33, No. 8, pp. 173-177. Paris, August, 1921.

The President of the General Syndicate of Ciders and Fruits for Cider-Making of France made enquiries respecting the manufacture of non-alcoholic ciders and received

the following note from the French Commercial Office for Switzerland.

Note on the Manufacture of Non-Alcoholic Wines and Ciders in Switzerland.—In order to obtain a non-alcoholic cider of good quality, it is necessary to mix apples of various kinds (sour and sweet), for the flavour depends upon the cider containing sugar, tannin, acids in certain proportions. The apples should be chosen by an expert, for the kind of fruit selected determines the quality and clarity of the juice extracted. If sweet and acid apples are mixed in the right proportions, the juice expressed should be relatively clear and not require filtering.

Fruits of different kinds are not mixed as a rule, the apple juice being the extract of apples without any admixture of pears or other fruit.

The apples or grapes should be ripe, but not over-ripe. In no case is fruit used that is not sufficiently mature for the table. Should they be dusty or covered with soil, they may be washed, but if clean this is optional.

To extract the juice, the fruit is first pounded in stone mortars, and the pomace thus obtained extracted by a hydraulic press. It is of the greatest importance that, during pressing and the subsequent operations, the juice should never come into contact with iron, which imparts a disagreeable taste. Iron utensils ought therefore never to be used.

Pomace is not tunned before pressing; in fact, all the operations must be carried out rapidly so that the juice will not remain too long in contact with the air, which might start fermentation.

The hydraulic presses used in most of the Swiss factories are supplied by Messrs. Rauschenbach of Schaffhausen (Switzerland).

As soon as the juice leaves the hydraulic press, it passes through a pipe to a metal sterilizing apparatus filled with water at a temperature of 66°C. to 70°C. The juice, which is in a spiral aluminum tube, remains in the sterilizer for half an hour at most, after which the operation is complete. It should be noted that, after this stage, the juice should never come into contact with the air.

After sterilization, the cider or wine is taken into receptacles holding 15 to 20 hectolitres, from which all the air has previously been expelled. In these it remains for some weeks or even months before being bottled. The receptacles are provided with a fermentation indicator consisting of a black fluid contained in a glass spiral in the form of a horizontally-placed S, which turns white as soon as fermentation begins.

Before bottling, the juice is filtered through asbestos and can be filtered several times if necessary, in order to render it perfectly clear, but it is better only to filter it once, for the repetition of the process affects the taste of the liquid. Asbestos filters are well-known, and their use is not a trade secret. They are made in Switzerland by Messrs. Th. Seitz at Kreuznach-am-Rhein, and Messrs. Hoeny, Mechanische Werkstatte at Ober Meilen.

The bottles used for alcohol-free wine or cider are not sterilized before they are filled, but are very carefully washed. It should be noted that the success of the preparation largely depends upon the scrupulous cleanliness of all the apparatus and bottles used.

The bottles, when filled with juice, are placed open in a metal vat provided with a cover. The vat is then filled with water at about 70°C., the water coming up as far as the necks of the bottles. Sterilization is complete at the end of about half an hour. The bottles should be corked at once, to prevent the juice cooling. Metallic caps fitted inside with a ring of cork, are generally used in mechanical corking. This process appears the surest and most economical. It is necessary for the bottles to be hermetically closed in order to prevent any subsequent fermentation of the juice.

In making alcohol-free champagne or sparkling wines the same process is employed up to and including the bottling. Before sterilization, the bottled juice is subjected to carbon dioxide under pressure of 2 to 6 atmospheres. This pressure varies according to the temperature of the wines, and the nature of the product required. It should be 2 atmospheres in the case of sparkling wines and 6 or 7 in that of champagne. A lemonade apparatus is generally used for introducing the carbon dioxide into the bottles, which should be made to withstand the pressure.

The corking operation is the same as for ordinary champagne bottles, the cork stopper being wired on. Sterilization is effected later in the autoclave; the pressure in the interior of the apparatus must be increased progressively as the temperature arises, in such manner that the external pressure balances the pressure inside the bottles. This is a very delicate stage of the manufacture, as the bottles easily explode. The bottles are then laid down in a cool place.

The pomace is as a rule used for the making of preserves, or for distillation. It is not dried, but is employed in its natural condition.

The "Alkoholfreie Weine und Conservenfabrik Meilen A.-G.," at Meilen, made apple-honey for some years, but has since given up doing so. This product is obtained by merely evaporating the juice in the open air in a jacketed apparatus similar in shape to a kind of retort, that is always to be found in jam factories.

In the manufacture of alcohol-free wines and ciders, and also in that of apple-honey,

no foreign substance (such as glycerine for instance,) is ever introduced to promote coagulation.

The temperature of the work-rooms is not of special importance, for the operations must be performed as quicly as possible.

As regards the utilization of the by-products, it appears from the experience of the Swiss factory, that all that can be done is to use them for distillation, or sell them to preserve factories. Generally, a preserve and jam factory is annexed to the alcohol-free wine factory.

The process described has not been patented, but patent machines are used, which can be procured, on application to the firms whose addresses are given in this abstract.

1170.—**The Oxyhydridase of Milk.**—ALOY, J., and VALDIGNIE in the *Comptes rendus des Seances de la Societe de Biologie*, Vol. LXXXV, No. 26, pp. 333-334. Paris, July 16, 1921.

The milk ferment discovered by Schardinger that decolourizes methyl-blue in the presence of formaldehyde, belongs to the class of ferments possessing both oxidizing and hydrogenating properties, which are known as oxyhydridases. The authors isolated this ferment from milk by saturating it with powdered sodium chloride; leaving it to stand for 12 hours, then filtering it and finally precipitating the filtrate by a semi-saturated solution of ammonium sulphate.

The oxyhydridase thus separated gives the reactions of protein substances; it is insoluble in water, soluble in solutions of neutral salts, and precipitated from these solutions by acetic acid. It contains a considerable amount of phosphorus and iron and is thus a phospho-proteid.

Dried Milks.—SHERMAN, H. C., in *American Journal of Public Health*, Vol. 12, No. 2, pp. 113-116. Boston, 1922.

The annual report of the committee on nutritional problems of the American Public Health Association deals exclusively with dried milk with special reference to the possible development of the dry milk industry as a means of increasing, conserving, and marketing the milk supply. The report discusses in turn the sanitary aspects of the milk drying industry, the nutritive value of dried milk and its products, and the possible effects of a dry milk industry upon the dairy industry and milk supply as a whole. It is shown that ordinary processes of commercial drying are more efficient than pasteurization in destroying the bacteria originally present in the milk, and that the dried product is no more subject to secondary contamination than any other dried food. In regard to its nutritive value, dried milk is considered to be equal in value to pasteurized milk, the only significant change occurring in either manipulation, if properly conducted, being in the loss of the antiscorbutic vitamin.

In regard to the effects of the dry milk industry upon the dairy industry, it is stated that "the opinion is widely held, and in our judgment well founded, that the dry milk industry will not seriously compete with or in any way injure the fluid milk industry as it now exists, but rather, will supplement it and make possible the good use of its seasonal surplus; that with increasing recognition by consumers of the great importance of milk as food for adults as well as for children, dried milk will come to be largely used in cookery without diminishing the consumption of milk in fluid form; that the drying of milk both as a means of preservation and of greatly reducing transportation costs will permit the extension of the milk industry into regions too distant from large markets to ship milk in fluid form; that because of this extension of the source of supply, the greater consumption of milk in its different forms should not necessarily result in higher prices; that the drying of milk will greatly facilitate the production and handling of milk in the South, where lack of natural ice so greatly hampers the fluid milk industry and where an increased use of milk in the diet is so urgently needed, and will doubtless do more than anything else toward the lowering of the infant death rate and the suppression of pellagra among adults.

PLANT DISEASES

1179.—**Phytophthora sp. and Septoria Lycopersici on Tomato Seedlings, in New South Wales.**—DARNELL-SMITH, G. P., in *The Agricultural Gazette of New South Wales*, Vol. XXXII, Pt. 8, p. 577. Sydney, August, 1921.

Tomato seedlings in certain districts in New South Wales were attacked last year by blight (*Phytophthora* sp.) and leaf spot (*Septoria Lycopersici*).

The part attacked is generally some portion of the stem in the majority of cases at or near the ground level. The seedlings fall over and wilt.

S. Lycopersici is recognized by pale or ochre coloured spots on which are produced numerous minute black bodies which contain the spores. Affected leaves have a tendency to curl.

The following control measures are recommended by the author:—(1) Remove and burn all diseased plants; (2) Spray the rest with Bordeaux mixture; should wet weather prevail, other sprayings may be necessary at intervals of about 10 days; (3) Avoid keeping the seed-bed too moist; (4) Water the soil rather than the plants; Shelter the beds with some impervious material during damp weather.

INJURIOUS INSECTS

Fighting Insects With Aeroplanes.—NEILLIE, C. R., and HONSER, J. S., in *National Geographical Magazine*, Vol. 41, No. 3, pp. 333-338. Washington, D.C., March, 1922.

An account is given of the successful use of aeroplanes in dusting tall trees infested with *Ceratomia catalpae*, Bdv., in Ohio. The experiment was made against the second brood of the moth, the plane used being equipped with a metal box secured to the fuselage. This box has a capacity for holding a little more than 100 lb. of dry lead arsenate. At the bottom a sliding gate is arranged to be operated by a handle accessible to the observer. A crank at the top is connected to a revolving mechanism at the bottom by a sprocket chain, which, when placed in motion, releases the powder through the previously opened sliding gate The dust thus dropped into the air current set up by the revolving propeller is violently agitated and forms a dense white cloud, which trails out behind the moving plane.

The grove of *Catalpa* treated by this method was situated on level ground, and was a plot 800 ft. long and 325 ft. wide containing 4,815 trees 25 to 30 ft. high. The poison was applied between 3 and 4 p.m. on August 3rd, 1921, under almost ideal weather conditions, a steady wind blowing at from 8 to 11 miles an hour. The plane flew at 80 miles an hour at an altitude of from 20 to 30 feet and parallel to the grove, 53 yards to the windward of it. The dust was carried by the wind over the grove, every tree being covered. The plane distributed about 175 lb. of poison, and subsequent examinations showed that not more than one per cent of the larvae remained alive on the trees. The poison can be placed with marked precision at any point intended, thus dispelling the expectation that it would be wholly beyond control as a result of the air currents.

With further development and improvements this should prove a successful means of controlling forest insects, but its usefulness in treating cotton or other low-growing crops or even large fruit orchards still remains to be proved.

Apanteles Melanoscelus, an Imported Parasite of the Gipsy Moth.—CROSSMAN, S. S., in *United States Department of Agriculture Bulletin* 1028, pp. 25. Washington, D.C., 1922.

This is a report of studies of one of the parasites imported from abroad during the course of work against the gipsy and brown-tail moths. The first part (pp. 2-14) contains a description of the species and an account of its life history and habits. *A. melanoscelus* Ratz. is close to *A. solitarius* Ratz., but the differences are thought to be sufficiently well marked and sufficiently constant to justify holding the two forms distinct. The methods used in the biological work are briefly described.

It hibernates as a third-stage maggot within its tough sulphur-yellow cocoon, and, under field conditions, the adults emerge over a period of about three weeks. Emergence is at its height when the gipsy moth egg hatching is at its maximum, usually during the second week in May. As in the case of many parasitic Hymenoptera, they often reproduce parthenogenetically. The greatest number of eggs secured from a single female was 535, and a dissection of this individual showed that her ovaries still contained about 150 mature eggs and about 200 eggs in different stages of development, indicating that under natural conditions a female is capable of ovipositing in the vicinity of 1,000 eggs. From 48 to 72 hours are required for the incubation of the egg. There are three larval stages, which, depending upon the temperature, vary for the first stage from 2 to 3 days in the spring generation and from 6 to 8 days in the summer generation, for the second stage from 2 to 3 days by the first-generation larva and from 5 to 7 days by the second generation, and the period spent by the third-stage maggot within its host varies from a few hours to 2 days with the spring generation and as long as 3 days with the summer generation. The pupal stage lasts from 5 to 9 days.

The seasonal history varies considerably with the season and the issuance of adults of *A. melanoscelus* from their hibernating cocoons, commencing about the time of maximum hatch of the gipsy-moth egg, usually near the middle of the second week in May. Under field conditions, females of *A. melanoscelus* do not begin to oviposit immediately, for the bulk of issuance of the spring generation parasite maggots is around June 12. The adults which develop from these maggots are found issuing from 7 to 11 days later. Cocoons of the second generation, or those in which the parasite is to pass the winter begin to appear about July 4, but usually not in abundance until the second week in July.

The records show that healthy gipsy-moth larvae eat from two to three times as much as those which contain parasite larvae. The gipsy-moth larva from which a parasite larva has issued eats no more, although it may live a few hours or as long as 2 weeks, the average being 7 days. While in field-collected material in this country it has only been reared from the gipsy moth, it is recorded as a parasite of the satin moth (*Stilpnotia salicis* L.) in Europe. It is thought to been responsible for the death of many tussock-moth larvae during an outbreak of the pest at Somerville, Mass., in August, 1920. In experimental work it was reared from several larvae, including the ten

caterpillar, the forest tent-caterpillar, the white-marked tussock moth, the brown-tail moth, and *Olene basiflava* Pack.

The second part of the report (pp. 14-25) deals with the introduction and establishment of this parasite in the United States, and a map is attached which shows the dispersions of the gipsy moth and *A. melanoscelus* in New England in 1920. It is now firmly established and is spreading rapidly from the colonies which have been liberated, and is increasing in spite of its being heavily parasitized by secondaries. The fact that it is able to complete its life cycle on several native insects adds considerably to its value as a permanent parasite, and makes its permanent establishment more certain than if the gipsy moth were its only host.

877.—**Stilpnotia Salicis a Macrolepidopteron Injurious to Poplars and Willows, Reported for the First Time From Massachuetts, and New Hampshire.**—BURGESS, A. F., in *United States Department of Agriculture, Department Circular*, 167, 16 pp. Washington, D.C., May 1921.

The satin moth (*Stilpnotia salicis* L.) —an insect well known in Europe for the injury caused by its larvae to poplars and willows—was reported for the first time in the United States about July 1, 1920. At this date, it was found that a number of poplar trees (*Populus monilifera* var. *angulata*) on the Malden and Medford line north of Boston, Massachusetts, were beng defoliated by the larvae of this insect. A hasty examination showed that the most severe defoliation was in the region where the caterpillars were first reported, and several trees in a small group of *P. pyramidalis* (Lombardy poplar) had been completely stripped.

Observations in the field, in 1920, indicated that the small larvae of *St. salicis* chiefly fed on different species of poplar, those most severely attacked being the Carolina (*P. monilifera* var. *angulata*), Lombardy (*P. pyramidalis*) Balm of Gilead (*P. balsamifera*) and Silver Leaf (*P. alba*).

As regards the distribution of the satin moth in the United States, the insect is now known to occur over an area of 642 square miles, including 60 towns in Massachusetts, and 4 in New Hampshire. Probably a few of the insects had already existed for some years in the locality where they were first observed.

While it is impossible to determine the original source of the infestation it is very probable that *St. Salicis* was brought into the United States during the dormant season in crevices of the bark of live or dead trees; bits of infected bark mixed with packing material could easily furnish a means of transporting the insect, for the hibernating webs of the small larvae concealed in the crevices of bark are so inconspicuous as to escape even careful inspection.

The larvae and pupae of the satin moth are effectively attacked by the adult and larval forms of *Calosoma sycophanta*. Another formidable enemy of the larger larvae of *St. salicis* is *Compsilura concinnata* Meigen.

Telenomus californicus Ash. is a parasite that has been reared from the eggs of the satin moth. The prospect of controlling the latter by parasites is encouraging but it may be necessary to import into the United States from Europe some of its enemies that do not at present exist in the former country.

Time has not permitted experiments to be carried out in the infected area to determine the most effective remedies against *St. salicis*, but from what is so far known concerning the latter—the paper analysed gives the data collected during the summer of 1920 respecting the stages of development and the habits of the insect—the following treatment would seem advisable.

(1) Spray poplars and willows as soon as they are in full leaf with arsenate of lead at the rate of 10 lbs. to 100 gallons of water, using soft soap to make the remedy adhere to the leaves.

(2) If the infestation is severe, it may be necessary to repeat the operation by the middle of June.

(3) If egg clusters are abundant on the trees in July, spray again with the same material about August 1st.

The experience of a full year's work on this insect will probably result in a modification of these recommendations.

Experiments With Contact Dust.—HEADLEE, T. J., and RUDOLFS, W., in *Journal of Economic Entomology*, Vol. 15, No. 1, pp. 75-81. Concord, N.H., 1922.

From the data here presented it is concluded (1) that proper dust carriers impregnated with a 2 per cent nicotine are as effective in the control of the pink and green aphis on potatoes as is nicotine delivered in a liquid form; (2) that nicotine delivered as a dust has the disadvantages of a much longer period of kill than that necessary for nicotine delivered as a liquid, rendering the work of the dust liable to serious interference by rainfall, and the cost is materially larger than control with nicotine delivered as a liquid; (3) that the advantages of nicotine delivered as a dust are primarly concerned with the increased speed in covering large acreages and the freedom from the necessity of a nearby water supply; (4) that there occurs in all carriers with which the authors have experimented a tremendous waste of nicotine; and (5) that the improvement of nicotine dust is to be sought in the more rapid evolution of the 2 per cent or less of nicotine, which is within the range of reasonable practice. or in the delivery of such nocotine as is evolved in close contact with the bodies of the lice, or in developing along both these lines.

OTHER ARTICLES ON SCIENCE AND PRACTICE OF AGRICULTURE

On account of lack of space the following articles in the International Review of the Science and Practice of Agriculture can only be referred to. Anyone desiring the articles may obtain them from the Institute Branch, Department of Agriculture, Ottawa.

1090.—**The Plough as a Means of Making Gradually Sloping Terraces.**—GIANNOBI, I., in *Il Coltivatore*, year 67, No. 23, pp. 133-138. Casale Monferrato, August 30, 1921.

1094.—**Leucite.**—GIANNOBI, J., *La Leucite, Memoria premiata col Premio Cesare Zucchini della R. Universita di Bologna*, pp. 56, bibliography of 74 works. Osimo, 1921.

1095.—**Radioactivity Experiments in Spain.**—*Estacion Central de Ensayos de Semillas La Moncloa, Botein Trimestrial*, Year I, No. 2, pp. 7-8. Madrid, June, 1921.

1106.—**Experiments on Flax Hybrids.**—BLARINGHEM, L., in the *Comptes rendus de l'Academie des Sciences*, Vol. 173, No. 5, pp. 329-331. Paris, August 1, 1921.

1109.—**Commercial Production of Seed According to the Swedish Improved Method, and the Progress Already Made in Canada and New South Wales.**—I. BREAKWELL, E., "The Production of Better Seed in Other Countries," *The Agricultural Gazette of New South Wales*, Vol. XXXII, Pt. 4, pp. 245-248. Sydney, April, 1921.—II. NEWMAN, L. H., "Seed Centres in Canada." *The Agricultural Gazette of Canada*, Vol. VIII, No. 2, pp. 212-214.—III. CUTLER, G. H., "The Beginning of an Important Movement for Supplying Pure Seed." *Ibid.*, p. 154. Ottawa, March-April, 1921.

1111.—**Experimental Cultivation of Foreign Wheat and Oats in Italy.**—POGGI. G., in *Il Coltivatore*, Vol. 67, No. 24, pp. 174-181, Casale Monferrato, August 30, 1921.—ROSSI, G., in the *Rivista di Agricoltura*, Vol. XXIV, No. 34, pp. 481-482. Piacenza, August 26, 1921.

1118.—**Experiments in Growing Lucerne on Dry Soils in Italy.**—*Il Coltivatore*, Vol. 56, No. 21, pp. 81-83. Casale Monferrato, July 30, 1921.

1121.—**Hemp Stalks as a Raw Material for Paper Manufacture.**—RASSOW, B., and ZCSHENDERLEIN, A., in the *Zeitschrift fur angewandte Chemie*, Year XXXIV, No. 41, pp. 204-206. Leipzig, May 24, 1921.

1135.—**The Chemical Composition and Forage Value of the Straw of Different Varieties of Wheat Grown Under the Same Conditions, in Italy.**—ALBERTONI, F., and ROSINELLI, G., in *Le Staziomi sperimentali italiane*, Vol. LIV, Parts 4-6, pp. 129-144. Bibliography of 6 works. Modena, 1921.

1140.—**A German Study of the Transmission of Coat Colour in Thoroughbreds.**—STERNFIELD, R., in the *Zeilschrift fur Gestutkunde und Pferdezucht*, Year XVI, Part 4, pp. 69-76. Hanover, 1921.

1146.—**Experiments Made in the United States on the Effect of Hydrocyanic Acid in Sudan Grass on Cattle.**—SWANSON, C. O., in *Journal of the American Society of Agronomy*, Vol. XIII, No. 1, pp. 33-36. Washington, January, 1921.

1147.—**German Experiments on the Value of Urea in the Feeding of Sheep and Other Ruminants.**—VOLTZ, W., in I. *Mitteilungen der Deutschen Landwirtschaftgesellschaft*, Year XXXIV, No. 27, pp. 372-375. Berlin, July 1919; II. *Biedermanns Zentralblatt*, Year XLIX, Part 7, pp. 269-272. Leipzig, July 1920.

1150.—**German Experiments Made on Feeding Pigs With Rations Containing Large Quantities of Fish Meal.**—MULLER, K., in the *Deutsche Landwirtschaftliche Tierzucht*, Year XXV, No. 32, pp. 333-334. Hanover, August, 1921.

1156.—**Decree of French Minister of Agriculture Dated June 17, 1921, Respecting Enterprises for Mechanical Ploughing.**—*Journal officiel de la Republique francaise*, Year LIII, No. 163, pp. 7009-7010. Paris, June 19, 1921.

1159.—**The Beaters of Threshing Machines.**—CASTELLI, M., in *Il Villagio ed i Campi*, Year XLVI, No. 23, p. 2. Rome, June 4, 1921.

1161.—**Utilization of Waste Farm Products for Fuel.**—*Indian Engineering*, Vol. LXIX, No. 26, p. 362. Calcutta, June 25, 1921.

1171.—**Gerome or Gerardmer Cheese.**—BLIN, H., in *L'Alimentation moderne et les Industries annexes*, Year XIX, New Series, No. 16, pp. 231-232. Paris, July 1921.

THE INTERNATIONAL REVIEW OF AGRICULTURAL ECONOMICS.

The following is a brief indication of the contents of the more important articles in the May and June numbers of the Institute Bulletin. Persons interested in any of the articles may obtain the original Bulletin on application to the Institute Branch, Department of Agriculture, so long as the supply for distribution is not exhausted.

MAY NUMBER

Measures Relating to Agricultural Co-operation in Portugal.—21 pages. An account of the legislation adopted in Portugal during and since the war for the encouragement of the spirit of association among the rural classes. A summary of the legislation regarding co-operative agricultural credit banks is given as well as an account of the operations of these banks. There is also a detailed description of the agricultural syndicates.

The Work of the War Finance Corporation of the United States in Aid of Agriculture.—14 pages. Originally created as a war agency under an Act dated April 5, 1918, the War Finance Corporation was empowered by the American Congress in March, 1919, to assist in the task of reconstruction. It was authorized, in order to promote commerce with foreign nations through the extension of credits and to aid in the transition from the conditions of war to those of peace, to make advances not exceeding $1,000,000,000 to American exporters and American banking institutions for the purpose of financing the exportation of domestic products. This authority was exercised until May, 1920, when the activities of the Corporation were suspended. In the autumn of 1920 when the collapse in commodity markets became acute, the question of exports became a matter of general interest, and the Congress, in January, 1921, directed that the activities of the Corporation be resumed.

The article describes the business organization of the corporation and gives an account of the extension of its powers embodied in the Agricultural Credits Act of August 24, 1921. The work of the corporation in financing exports is described and details of the advances of funds for different purposes are given.

The Maintenance of the Agricultural Labour Supply in England and Wales During the War.—28 pages. The third and last installment of this article. It gives an account of the work of women on the land, also of other sources of labour, such as Belgian refugees, Danish labourers, conscientious objectors, national service volunteers, school boys, civil servants, etc.

Measures Adopted During the War to Maintain the Supply of Agricultural Labour in Italy.—30 pages. The immense quantities of material of all kinds required for military operations and for the needs of the Italian army, the increasing difficulty in obtaining supplies from abroad, rendering necessary the maximum utilization of internal resources, the calling up of all military classes and of those who had undergone a second medical examination after being pronounced unfit, the necessity of safeguarding the sources of national production, and for maintaining intact the economic forces of the country, were all factors converging to lead the Italian Government to issue a series of measures during the war intended to ensure to farms the supply of labour essential to their working.

During the earlier period measures of a general character were promulgated for the releasing of soldiers who could be utilized by farmers. As mobilization proceeded and labour became less and less available, the need was felt for special and wider measures in view of the requirements of agriculture. In the present article these measures are described in considerable detail. An account is also given of the employment of prisoners of war.

Other articles in the May number are: State Aid to Agricultural Co-operation in Bulgaria; the Establishment of a Co-operative Society for the Purchase and Sale of Land in Czecho-Slovakia; Agricultural Co-operation in Germany in 1919-20; Agricultural Co-operation in England and Wales in 1920-21; New Types of Tenant Farmer Agreements in Belgium; Land Reform Legislation in Lithuania; Ownership and Price of Land in Southern Rhodesia.

JUNE NUMBER

The Capitalization of Rural Co-operative Societies in Germany.—17 pages. The German juridical doctrine recognizes as "Genossenschaften" all independent societies having a corporate existence other than the State and the Communes. To these "Genossenschaften," in the widest sense of the word, belong capitalist companies (of which the share companies are the most important form), co-operative societies based on the real property of the members (*Realgenossenschaften*) and co-operative societies composed of individuals independently of the possession of real property (*Personalgenossenschaften*). The *Realgenossenschaften* are for the most part compulsory associations. A special law regulates the admission of members and the juridical relations of the members to one another and to the association; often, too, the method of conducting the business and the powers of the public authorities to make regulations for the

association are determined in advance. In some cases the right of the public authorities to supervise the associations is also contemplated. Amongst the co-operative societies of this kind are the societies for drainage and irrigation. The wish of the individual to belong to the society and to derive benefit from it or not has no special importance in these cases. In the interests of the community, the individual for whose advantage the society is formed is compelled to become and to remain a member. And the compulsion reaches such a point that the lands on which the society conducts its operations continue to belong to it even if they change hands, so that the new owner becomes compulsorily a member, while the original owner, when he transfers the property, withdraws from the association.

The "free" co-operative society, on the other hand, does not owe its formation to any compulsion. It cannot be a *Realgenossenschaft* and it is not usually a capitalist company, but is a *Personalgenossenschaft*. The persons who compose it, the members, are its supports and its object is to serve its members and, in turn, it is served by the capital, whereas in the commercial company (of which the typical form is the share company) it is the capital which commands. In some special cases a "free" co-operative society is established under the juridical form of a share company, but it usually assumes the form of a co-operative society registered under the law of 1889 (*Gesetz betreffend die Erwerbsund Wirtschatfsgenossenschaften*). The registered co-operative society is the form of undertaking adapted to the combination of persons economically weak. It allows such persons to develop a powerful economic action, to utilize the means of capitalistic activity and at the same time protects them against the harm which may result from it. The co-operative society is a potent instrument for individual inititaive, it promotes and strengthens in its members the consciousness of their own liability and trains them in independent management. The co-operative society puts self-interest at the service of the community.

This article deals only with the free rural co-operative societies, that is the co-operative societies which serve the population of the country districts. Amongst those there are many agricultural co-operative societies, which aim exclusively at serving the agriculturist (co-operative dairy societies, co-operative vine-growers' societies, co-operative threshing societies, etc.), but there are others which work in the interests of the rural population as a whole, such, for example, as rural credit societies (loan banks, Raiffeisen societies), co-operative societies for the supply of electricity, etc.

The rural co-operative societies may be divided into two groups—the co-operative credit societies and the so-called co-operative trading societies.

By capitalization must be understood the supply of capital and distinction must be made between the supply of capital for the working of the society itself and the employment of capital in the working of other undertakings.

The subject is covered under the following heads: The Supply of Capital for the Societies' Own Working; Owned Capital and the Methods of Obtaining It; The Economic Importance of Owned Capital; Borrowed Capital and The Means of Obtaining It; The Relations Between the Supply and the Employment of Capital.

Agricultural Credit Facilities in Great Britain and Ireland During the War.—10 pages. The need of additional credit facilities were not very strongly felt by the farmers of Great Britain and Ireland during the early part of the war, and, for reasons of public economy, some of the facilities which they had previously enjoyed were restricted. It was not until efforts were being made in 1917 largely to increase the area of arable land that some steps were taken to give greater opportunities to farmers to obtain the capital required for putting the scheme into execution. The article indicates for each of the three kingdoms separately the initial restrictions (if any) and the subsequent increase of agricultural credit facilities.

Other articles in the June number are:—The General Confederation of the Vine Growers of France; A French Co-operative Society of Seed Producers; Agricultural Co-operation in Greece; The Problem of Credit for Russian Agriculture; The Third International Congress on the Teaching of Household Management; The Subdivision of Landed Property in Egypt; The Establishment of Military Agricultural Colonies in Mexico; French Colonization in Morocco; The Cultivation of Allotments in Austria During the War.

AGRICULTURAL STATISTICS

THE CEREAL CROPS OF 1922

WORLD'S WHEAT REQUIREMENTS AND SUPPLIES

A good deal has been written recently by the American Trade Journals in order to explain the steady increase in the price of wheat which, since the low point in August, has risen in North America from 12 to 15 cents a bushel. For a time the congestion in transportation facilities and the threatened war with Turkey were stressed, rather than fundamental conditions. From the following tables these conditions appear so striking that such claims have by comparison but little value. It is perhaps not amiss that some congestion should have existed for, even under the conditions of which there has been complaint, the United States shipped 38 million bushels of wheat in August to Canada's 14 million. Although the United States figures are not available for September, the total shipments from North America, as reported by Mr. Broomhall, are as large as those of August, while the shipments from Canada were only a little over 12 million bushels. The fact is a readjustment was due to a figure more nearly comparable to that of other commodities, and to the very striking rise at Liverpool of some 25 cents a bushel. The Europeans as well as the Americans had overstayed their market. Justification for the rise is basic. It represents the European shortage in production and supply. The Europeans have been tardy in engaging their limited credit, hoping perhaps to put off the evil day of heavy importations until they had used up as much as possible their own crops. However, impending future needs at last have forced them into the market for heavy commitments which may not even be met by the large prospective supplies in North America. They must see to it that these supplies are kept moving in unprecedented quantities, and it is only enhanced prices that can accomplish that result.

It is true that the world's exports for August are fairly large at 65 million bushels, but last year when Europe had reaped a crop as much larger than the preceding one as the present crop is smaller than last year's, the August exports were 80 million bushels, the United States shipping the unprecedented total of 66 million. At that time the prices were over 50 cents per bushel in excess of present prices, and European currencies did not have the increased purchasing power which they enjoy today. Still, last year in the months of October, November and December, when Australia was shipping very heavily, the world's total exports ran 60,473,000, 63,187,000 and 63,769,000 bushels respectively. Now Australia is out of the market and Argentina is on the very point of dropping out. Certainly, in order to meet the present increased world's demand, at least from 125 to 150 million bushels larger than the demand of last year, and with Australia and Argentina already sold out, the shipments of Canada and the United States will have to be abnormally heavy. It will probably be nearly March next before the new crop of distant Australia and Argentina can reach Europe in large volume; in the meantime, it is only firm prices, if not steadily increasing prices, that can assure the volume of movement from North America that can fill the world's urgent needs.

These facts are so important in Canada's present conditions that is is imperative the details should be presented and carefully examined in the following series of tables, which deal principally with wheat, but also to a lesser extent with rye, oats and barley. It is perhaps not sufficiently realized that such satisfactory data, furnished from all countries so early in the crop season, have been possible only because of the admirable work during the past 11 years of the International Institute of Agriculture. These figures, when cabled or otherwise published by the Institute, at once become public property, and are often used by Governments and officials and individuals without any reference to the agency which has so skilfully organized them, and is still energetically engaged in improving the service. Generally the data used in these reports of the world's acreage, production and trade in respect of the different cereals are abstracted from the Bulletin of the International Institute of Agriculture entitled "The International Crop Report and Agricultural Statistics," Only, in the case of figures for any country not being for the moment available, estimates are made by this Branch or accepted from other reliable sources based on acreage and the most recent condition reports. Frequently the Institute cables the latest data and this source of information is always preferred.

TABLE I

WORLD'S PRODUCTION OF WHEAT

European countries as at present	1922	1921	Average 1916-20	Pre-war average 1909-13	European countries as before the war
	Bushels	Bushels	Bushels	Bushels	
Great Britain and Ireland	64,000,000	73,795,000	68,681,000	59,640,000	Great Britain and Ireland.
France (*a*)	235,380,000	323,470,000	213,012,000	317,639,000	France.
Germany	69,666,000	107,800,000	81,143,000	152,120,000	Germany (*b*)
Belgium	9,870,000	14,495,000	7,452,000	14,894,000	Belgium.
Netherlands	5,210,000	8,686,000	5,006,000	4,896,000	Netherlands.
Denmark	6,400,000*	11,144,000	5,997,000	5,344,000	Denmark.
Norway	548,000	972,000	781,000	306,000	Norway.
Sweden	8,478,000	12,577,000	8,947,000	8,103,000	Sweden.
Finland	176,000	280,000	254,000	251,000	Finland.
Spain	125,908,000	145,151,000	139,715,000	130,447,000	Spain.
Portugal	5,600,000*	8,613,000	8,597,000	6,985,000	Portugal.
Italy	162,407,000	192,838,000	168,187,000	183,336,000	Italy.
Switzerland	3,571,000	5,284,000	6,029,000	3,314,000	Switzerland.
Luxemburg	500,000	661,000	781,000	615,000	Luxemburg.
Poland (new)	44,794,000	37,410,000	22,741,000	19,045,000	Poland (Russian)
Czecho-Slovakia	30,472,000	38,682,000	26,362,000		
Austria	5,600,000*	6,452,000	5,269,000	60,842,000	Austria.
Hungary	43,952,000	52,716,000	38,295,000	169,645,000	Hungary.
Jugo-Slavia	42,000,000*	51,867,000	43,001,000	14,746,000	Serbia.
Roumania	87,762,000	78,564,000	61,310,000	87,792,000	Roumania.
Bulgaria	34,343,000	42,510,000	30,000,000	41,994,000	Bulgaria.
Greece	9,553,000	11,170,000	11,001,000	9,400,000	Greece.
Total Europe	996,185,000	1,225,137,000	952,561,000	1,291,354,000	

(*a*) Including Alsace-Lorraine for first three columns.
(*b*) Including Alsace-Lorraine for pre-war average.

Countries	1922	1921	Average 1916-20	Pre-war average 1909-13
	Bushels	Bushels	Bushels	Bushels
North America—				
Canada	388,773,000	300,858,000	228,410,000	197,118,000
United States	810,123,000	794,893,000	799,000,000	686,697,000
Total North America	1,198,896,000	1,095,751,000	1,027,410,000	883,815,000
Asia—				
India	366,351,000	250,356,000	344,736,000	351,767,000
Japan	26,495,000	26,921,000	30,246,000	24,166,000
Total Asia	392,846,000	277,277,000	374,982,000	375,933,000
Africa—				
Algeria	18,233,000	33,764,000	25,730,000	34,998,000
Egypt	36,648,000	37,011,000	32,073,000	34,121,000
Morocco	9,553,000	17,466,000	19,025,000	18,202,000
Tunis	3,307,000	10,623,000	7,395,000	6,224,000
South Africa	8,000,000*	8,689,000	7,304,000	6,127,000
Total Africa	75,741,000	107,553,000	91,527,000	99,672,000
South America—				
Argentina	200,000,000*	154,875,000	171,017,000	147,072,000
Chili	22,000,000*	22,179,000	21,801,000	21,243,000
Uruguay	12,000,000*	12,125,000	7,811,000	6,519,000
Total South America	234,000,000	189,179,000	200,629,000	174,834,000
Australasia—				
Australia	124,200,000	132,285,000	106,637,000	90,500,000
New Zealand	8,000,000*	10,500,000	5,978,000	7,070,000
Total Australasia	132,200,000	142,785,000	112,615,000	97,570,000
World's Total	3,029,868,000	3,037,682,000	2,759,724,000	2,923,178,000

*Figures in the first column followed by an asterisk are unofficial, being based on acreage and condition reports.

TABLE II—DIFFERENCES IN WHEAT PRODUCTION IN EUROPE BETWEEN THE CROPS OF 1922 AND 1921

Countries	Increase (+) or decrease (—) from 1921
	Bushels
Great Britain and Ireland	— 9,795,000
France	— 88,090,000
Germany	— 38,134,000
Belgium	— 4,625,000
Netherlands	— 3,476,000
Denmark	— 4,744,000
Norway	— 424,000
Sweden	— 4,099,000
Finland	— 104,000
Spain	— 19,248,000
Portugal	— 3,013,000
Italy	— 30,431,000
Switzerland	— 1,713,000
Luxemburg	— 151,000
Poland	— 7,384,000
Czecho-Slovakia	— 8,210,000
Austria	— 852,000
Hungary	— 8,764,000
Jugo-Slavia	+ 9,000,000
Roumania	— 9,000,000
Bulgaria	— 8,167,000
Greece	— 1,617,000
Total	+228,293,000

France, Germany, Italy and Spain exhibit decreases which amount to about 175,000,000 bushels. To the decrease in Germany of 38,000,000 bushels of wheat must be added a further decrease of 57,000,000 bushels of rye, in all a deficiency of 95,000,000 bushels of bread grains. Poland's big crop of rye, showing an increase over the preceding one of 43,000,000 bushels, will no doubt find in Germany a ready nearby market for its surplus. Hungary, Czecho-Slovakia and Bulgaria, which in the past have exported wheat, show this year each a deficiency of about 8 million bushels, or together, a total of 25 million. Denmark, Belgium and Sweden, each a little over four million short, have a total shortage of 13,468,000. Netherlands and Portugal together 6,489,000; Jugo-Slavia, Switzerland, Greece and Roumania 6,600,000. To the total wheat shortage in Europe of 228,293,000 bushels has to be added a total shortage of 51,000,000 bushels of rye, aggregating a deficiency of 279 million bushels of bread grains.

TABLE III

RYE

Countries	1922	1921	Average 1916-20
	Bushels	Bushels	Bushels
Germany	210,580,000	267,651,000	217,210,00
Belgium	18,598,000	21,273,000	9,742,000
Bulgaria	8,761,000	8,390,000	6,056,000
Spain	27,340,000	28,118,000	26,911,000
Finland	8,114,000	10,385,000	9,422,000
France	37,600,000	44,392,000	32,535,000
Greece	2,362,000	3,151,000	1,241,000
Hungary	22,374,000	23,177,000	20,564,000
Italy	5,019,000	5,634,000	4,829,000
Latvia	7,823,000	9,806,000	4,686,000
Netherlands	12,388,000	16,646,000	13,096,000
Poland	210,199,000	167,559,000	73,660,000
Roumania	7,874,000	9,081,000	9,445,000
Sweden	21,034,000	27,812,000	20,039,000
Switzerland	1,693,000	1,559,000	1,664,000
Czecho-Slovakia	45,799,000	53,735,000	32,942,000
Canada	49,602,000	21,455,000	7,350,000
United States	79,623,000	57,918,000	67,773,000
Totals	776,783,000	777,742,000	559,165,000
Totals for Europe	647,558,000	698,369,000	484,042,000

Speaking of Europe, Poland had an increase of 43,000,000 bushels, nearly three times the average production of the period 1916-20. There is the notable decrease of 57,000,000 bushels in Germany, which has to be added to the 38,000,000 bushels shortage in wheat. Excepting Bulgaria and Switzerland, whose production is practically the same as last year, there is a decrease in all the other European countries. That decrease was nearly 7,000,000 in France, over 57,000,000 in Germany and 8,000,000 in Czecho-Slovakia. Notwithstanding the big increase in Poland, there is a total decrease in Europe, so far as official figures are now available, of 51,000,000 bushels. When the rest of the data are available, it is not improbable that the total decrease will reach a figure between 75,000,000 and 100,000,000 bushels. Still, referring to available figures, the present production is 163,000,000 bushels greater than the average of 1916-20. So that, if there be added to the European deficiency in wheat of 228,000,000 bushels the further deficiency of 51,000,000 in rye, there appears in the total bread grains a decrease of 279,000,000 bushels. On the other hand the short crop of Europe is evenly balanced by the increase of 50,000,000 bushels in North America. Of this increase nearly 22,000,000 bushels is credited to the United States and 28,000,000 bushels to Canada. In fact the total Canadian rye production, more than twice last year's figures, if used exclusively for human food would suffice for Canada's total bread consumption. Henceforth, the importance of this fact must not be overlooked in estimating the quantity of wheat used for home consumption. The European eats on the average one bushel of rye for every two of wheat, although the per capita consumption varies by a wide margin between the maximum and minimum consuming countries.

TABLE IV

BARLEY

Countries	1922	1921	Average 1916-20
	Bushels	Bushels	Bushels
Belgium	3,991,000	5,117,000	3,900,000
Bulgaria	12,061,000	13,241,000	9,451,000
Spain	74,795,000	89,321,000	85,518,000
Finland	4,637,000	4,939,000	4,771,000
England and Wales	42,583,000	44,242,000	47,675,000
Hungary	21,428,000	21,408,000	22,586,000
Italy	7,946,000	10,362,000	8,283,000
Latvia	6,980,000	6,496,000	3,054,000
Netherlands	2,541,000	3,651,000	2,452,000
Poland	63,417,000	56,205,000	38,567,000
Roumania	87,267,000	45,254,000	67,606,000
Sweden	12,415,000	12,326,000	12,070,000
Switzerland	482,000	552,000	637,000
Czecho-Slovakia	42,145,000	47,472,000	37,238,000
Canada	76,396,000	59,709,000	58,962,000
United States	196,431,000	151,181,000	197,443,000
Japan	85,849,000	87,883,000	93,648,000
Algeria	19,805,000	48,226,000	36,772,000
Egypt	11,306,000	11,941,000	11,433,000
Morocco	22,506,000	29,510,000	33,093,000
Tunis	1,837,000	11,482,000	6,788,000
Totals	796,818,000	760,518,000	781,947,000
Totals for Europe	382,688,000	360,586,000	343,808,000

In Europe the decreases in Spain and Czecho-Slovakia, 14,526,000 and 5,327,000 bushels respectively, are more than counterbalanced by the increase of 42,013,000 and 7,212,000 in Roumania and Poland. Against the total increase for Europe of 22,102,000 bushels there appears a decrease of 45,070,000 bushels in Algeria, Morocco and Tunis. Canada and the United States together have increased their production by 61,937,000 bushels, and the world's total has increased 36,300,000 bushels.

TABLE V — OATS

Countries	1922	1921	Average 1916-20
	Bushels	Bushels	Bushels
Belgium	25,937,000	33,153,000	21,076,000
Bulgaria	10,797,000	10,609,000	6,592,000
Spain	32,871,000	33,521,000	31,320,000
Finland	26,962,000	26,380,000	22,898,000
England and Wales	85,800,000	92,068,000	106,040,000
Hungary	21,196,000	20,672,000	20,995,000
Italy	28,142,000	35,553,000	30,915,000
Latvia	16,746,000	15,852,000	6,444,000
Netherlands	15,463,000	20,036,000	19,966,000
Poland	172,547,000	141,448,000	121,471,000
Roumania	71,326,000	62,454,000	64,329,000
Sweden	68,233,000	72,093,000	65,412,000
Switzerland	2,321,000	2,857,000	3,653,000
Czecho-Slovakia	60,724,000	69,730,000	56,145,000
Canada	558,358,000	426,232,000	432,926,000
United States	1,229,774,000	1,060,737,000	1,329,518,000
Japan	12,644,000	11,375,000	7,317,000
Algeria	5,242,000	9,726,000	13,347,000
Tunis	908,000	3,891,000	2,886,000
Totals	2,445,991,000	2,148,387,000	2,363,250,000
Totals for Europe	639,065,000	636,426,000	577,256,000

Here against an increase of 2,639,000 bushels in Europe there is a decrease of 7,467,000 bushels in Algeria and Tunis. The increases of 31,099,000 for Poland and 8,872,000 for Roumania a little more than counterbalance the decreases in the other European countries. The world's total, of the countries reported, shows an increase of 297,604,000 bushels; only a little less than the increase of 301,000,000 of the oat crops of Canada and the United States.

It is to be noted further that the total for the countries here reported shows an increase of 82,741,000 bushels over the average of the period 1916-1920. Naturally, German figures not being yet available, make a material difference, as it is expected to exhibit a big decrease in all grains.

REQUIREMENTS AND SUPPLIES OF WHEAT

Proceeding to estimates of the world's needs and supplies wherewith to meet them, the following statement of requirements has been recently published by the "Corn Trade News" and deserves the closest attention:

Countries	Crops 1921	Imports 1921-22	Crop 1922	Estimated imports 1922-23
	Bushels	Bushels	Bushels	Bushels
Great Britain and Ireland	73,795,000	208,000,000	64,000,000	224,000,000
France	323,470,000	16,800,000	235,380,000	56,000,000
Germany	107,800,000	69,600,000	69,666,000	80,000,000
Belgium	14,495,000	36,000,000	9,870,000	40,000,000
Netherlands	8,686,000	20,000,000	5,210,000	24,000,000
Italy	192,838,000	100,000,000	162,407,000	112,000,000
Spain	145,151,000	9,600,000	125,908,000	16,000,000
Portugal	8,613,000	1,600,000	5,600,000	4,000,000
Denmark	11,144,000	4,000,000	6,400,000	5,600,000
Sweden	12,577,000	3,600,000	8,473,000	8,000,000
Norway	972,000	4,800,000	548,000	5,600,000
Switzerland	5,284,000	12,800,000	3,517,000	16,000,000
Austria	6,452,000	20,000,000	5,600,000	20,000,000
Finland	280,000	2,400,000	176,000	2,400,000
Poland	37,410,000	1,200,000	44,794,000	
Czecho-Slovakia	38,682,000	10,400,000	50,472,000	16,000,000
Greece	11,170,000	12,000,000	9,553,000	12,000,000
Total Europe	998,819,000	532,800,000	787,628,000	641,600,000
Ex-Europe		100,000,000		64,000,000
Grand Total		632,800,000		705,600,000

To cover European needs, which from decrease of production would seem to require an importation of 228,000,000 bushels greater than last grain year, Mr. Broomhall in this table forecasts an importation only 109,000,000 bushels greater. In view of the financial difficulties to be overcome and the rationing measures resorted to it is not unreasonable to expect, as he does, that consumption will be reduced by 122,000,000 bushels. We cannot, however, follow Mr. Broomhall in his reduction of the imports outside of Europe from 100,000,000 bushels actual imports last year to 64,000,000 bushels this year. From the fact that the recorded imports were last year 632,000,000 whereas the recorded exports were 678,000,000, it seems probable that the imports outside of Europe were more than 100,000,000 bushels. That is, there must have been imports over the 100,000,000 actually recorded that escaped the statisticians' notice.

Russia and India which imported last year about 16,000,000 bushels each can this year at least provide for their own needs. Africa, on the other hand, is this year short 32,000,000 bushels and must import liberally. We believe the actual imports of Ex-Europe will rather approximate 80,000,000 bushels, which would bring the grand total of requirements to 721,000,000 bushels.

Against these requirements the supplies that may be estimated from data available at the present date are presented in the following table:

Countries	Carry-over August 1st, 1922	Crop 1922	Probable Exports 1922-23	Estimated Carry-over August 1st, 1923
	Bushels	Bushels	Bushels	Bushels
United States	60,715,000	810,000,000	220,000,000	30,000,000
Canada	34,000,000	388,000,000	265,000,000	32,000,000
Argentina	35,000,000	200,000,000	110,000,000	20,000,000
Australia	.....	125,000,000	75,600,000	15,000,000
India	.....	366,000,000	25,000,000	16,000,000
Poland	.....	45,000,000	5,000,000	.....
Manchuria	.....	.....	10,000,000	.....
Roumania	.....	87,000,000	10,000,000	.....
	.....	.....	720,000,000	113,000,000

The exports are given in the following table by months and countries for the grain year August 1st, 1921, to July 31st, 1922. The figures for August and September 1922 are also added in so far as available:

Months	Canada	United States	India	Australia	Argentina	Totals five countries
1921-22	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels
August	6,013,000	66,963,000	220,000	5,304,000	1,983,000	80,263,000
September	8,770,000	38,950,000	(imp. 229,000)	5,293,000	1,289,000	54,302,000
October	24,097,000	25,366,000	(imp. 571,000)	10,056,000	954,000	60,473,000
November	33,106,000	19,453,000	(imp. 2,739,000)	9,991,000	637,000	63,187,000
December	37,856,000	15,014,000	(imp. 4,427,000)	7,859,000	3,040,000	63,769,000
January	8,946,000	14,982,000	(imp. 3,586,000)	13,644,000	29,627,000	52,386,000
February	8,595,000	10,991,000	(imp. 3,214,000)	14,570,000		48,969,000
March	10,481,000	14,370,000	(imp. 1,089,000)	15,194,000	20,013,000	60,058,000
April	4,045,000	10,244,000	.....	13,118,000	14,257,000	41,664,000
May	16,985,000	14,267,000	.....	9,683,000	14,243,000	55,178,000
June	15,201,000	18,200,000	.....	5,900,000	12,600,000	51,901,000
July	11,674,000	19,098,000	.....	3,100,000	12,900,000	46,772,000
Total for grain year 1921-22	185,769,000	267,898,000	.....	113,712,000	111,543,000	678,922,000
August	14,247,000	38,966,000	.....	2,800,000	9,300,000	.....
September	12,372,000	.....	.....	1,800,000	4,800,000	.....

The adverse exchange conditions have been much stressed as barriers to European imports to the full extent of requirements. For the chief countries outside of Germany that argument does not hold.

The following examples will illustrate. On August 25th last the price of a bushel of No. 1 Manitoba wheat on the Winnipeg market equalled 4s. 11d. in English money at the rate of exchange on that day. On August 26th, 1921, the cost in English money at the then rate of exchange was 8s. 11d. The corresponding figures for other European countries were: France 21·3 francs against 29·8 francs; Italy 35·7 liras against 54·9 liras; Germany 2,867 marks against 196

marks. It is known, however, that Germany is able through exports to produce sufficient credits to import all the wheat she needs. Last year, in spite of the rapidly falling value of the mark she imported nearly 70 million bushels, which is more than the pre-war average importation, and the exact amount which we forecasted in November 1921.

In conclusion—exporting countries on August 1st last found stocks in Europe comparatively depleted, the total supply small, and old stocks in the exporting countries more than ordinarily reduced. The latter condition is strikingly true in Australia and Argentina. By mid September Australia had no more wheat, and Argentina had only a remaining surplus of 22 million bushels. Neither of these countries can get their new crops on the European market in great volume before mid February. It is true that the Argentine, with a substantially increased acreage and good weather, forecasts a large crop, but the Australian prospects are only fair. India also with fair future prospects may be able to spare from 25 to 30 million bushels by August 1st next. With the European demand unusually large the biggest buying countries there acting under comparatively favourable prices and exchange conditions, North America has almost exclusive control of the market for the next three or four months. The Balkans, which last year only exported about 5 million bushels, will probably have very little more to spare, and the prospective exports of Poland and Manchuria are a negligible factor, while those of India, pretty evenly distributed throughout the grain year, cannot exercise a great influence. If provision is to be made in August next for carry-over equal to that of August of this year the world's supplies, presently and prospectively available, will probaly not more than meet the demand. In November last year our forecast of the world's imports was 636 million bushels; Broomhall recently published detailed figures showing an actual import of 632 million, and the exports which we then figured at 648 million bushels and recently placed at that same figure by Mr. Broomhall amount, according to other official statistics, to 678 million bushels. For the current year with a European shortage of 231 million, it is reasonable to expect the total actually marketed imports to reach 720 million bushels, as shown by the above table, and the export figures exceed them usually by at least 20 million bushels.

NOTES ON FOREIGN CROP CONDITIONS

(October 23, 1922)

United Kingdom.—Variable weather was experienced during the first part of October. Large quantities of grain were still lying out in the fields in some parts of the country. The quality of wheat is generally fair.

France.—The weather improved during the first week of October and work on the land was proceeding satisfactorily.

Germany.—Better weather was experienced lately which enabled the farmers to complete the harvest. Sowing of winter grain, which was everywhere in arrears, is proceeding more rapidly.

Italy.—Fine warm weather has been followed by much rain which should favour the new seedlings.

North Africa.—The prevailing hot, dry weather has brought ploughing and sowing in Algeria practically to a standstill.

China.—Reports indicate a 70 per cent crop of wheat. The rice crop is expected to be below average, although somewhat better than that of last year.

Manchuria.—A heavy crop of wheat is reported to have been raised this year.

Korea.—The 1922 harvest is likely to be inferior to that of last year.

India.—All restrictions on the importation of wheat from British India were removed, effective September 29th, Trade Commissioner Batchelder cabled the British Department of Commerce from Calcutta. Mr. Batchelder further states that the international price has become firmer and that it is expected exports will be made principally to England, the available surplus being estimated at 6,000,000 to 8,000,000 bushels.

According to a cablegram received from Rome on October 23rd there have been prolonged monsoon rains in India and sowing was proceeding favourably.

Argentina.—The wheat area is estimated at 17,200,000 acres against 13,927,000 last year. Crops are reported to be in excellent condition and a large yield of wheat is expected.

Australia.—Lately splendid rains fell in Victoria and South Australia, but rain is needed in New South Wales. The first official estimate of this year's wheat crop places it at 124,200,000 bushels against 132,285,000 last year. This indicates an exportable surplus of about 75,000,000 bushels. The area sown to wheat for the coming crop is unofficially estimated at 10,500,000 acres against 9,445,000 in 1921-22.

CABLED REPORT FROM THE INTERNATIONAL INSTITUTE

According to a cablegram received on October 23rd from the International Institute of Agriculture sowing is proceeding favourably in India where there have been prolonged monsoon rains. Progress in agricultural work has been normal in Italy, Hungary and Jugoslavia. In England, France, and Czecho-Slovakia work was greatly retarded during September on account of wet weather but better progress was general in October.

UNITED STATES OCTOBER CROP REPORT

The October crop report of the United States Department of Agriculture cuts the corn crop 22 millions under the September 1st estimate but leaves it 23 million bushels above the 5-year final estimate. In 11 surplus States there are apparently 17,100,000 less than at September 1st, but Iowa shows 9 millions more, while Illinois and Nebraska lost about 13,000,000 bushels each during the month.

Spring wheat shrank 8,351,000 bushels since the September estimate, but the total crop is about 15 millions above last year's final estimate. Details follow:

Crops	October 1st, 1922 forecast	Final estimate 1921
Winter wheat, bushels	541,809,000	587,032,000
Spring wheat, bushels	268,314,000	207,861,000
All Wheat, bushels	810,123,000	794,893,000
Corn, bushels	2,853,399,000	3,080,372,000
Oats, bushels	1,229,774,000	1,060,737,000
Barley, bushels	196,431,000	151,181,000
Rye, bushels	79,623,000	57,918,000
Buckwheat, bushels	14,051,000	14,079,000
White potatoes, bushels	433,015,000	346,823,000
Sweet potatoes, bushels	105,490,000	98,660,000
Flaxseed, bushels	11,725,000	8,112,000
Cotton, bales	10,135,000	7,954,000
Hay, tame, tons	92,886,000	81,567,000
Hay, wild, tons	15,850,000	15,235,000
Sugar beets, tons	8,070,000	7,782,000
Grain sorghums, bushels	95,840,000	115,110,000
Peanuts, lbs	674,478,000	816,465,000
Beans, bushels	13,013,000	9,118,000

LIVE STOCK STATISTICS

FRANCE

Classification	Numbers on		Increase (+) or decrease (−)	
	31 December, 1921	31 December, 1920	in number	per cent
Horses	2,706,110	2,635,350	+ 70,760	+ 2·7
Mules	186,420	180,600	+ 5,820	+ 3·2
Asses	295,780	298,180	− 2,400	− 0·8
Cattle	13,343,440	13,217,240	+126,200	+ 1·0
Sheep	9,599,560	9,405,870	+193,690	+ 2·1
Pigs	5,166,080	4,941,460	+224,620	+ 4·5
Goats	1,361,180	1,340,890	+20,290	+ 1·5

ENGLAND AND WALES

Classification	Numbers on		Increase (+) or (−) decrease	
	3 June, 1922	3 June, 1921	in number	per cent
Horses	1,340,000	1,384,000	− 44,300	− 3·2
Cattle	5,721,800	5,516,700	+205,100	+ 3·7
Sheep	13,436,700	13,831,500	−394,000	− 2·9
Pigs	2,296,700	2,505,500	−208,800	− 8·3

LATVIA

Classification	Number on		Increase (+) or decrease (−)	
	June, 1922	1921	in number	per cent
Horses	303,000	282,500	+ 20,500	+ 7·3
Cattle	810,500	799,500	+ 11,000	+ 1·4
Sheep	1,161,500	1,132,000	+ 29,500	+ 2·6
Pigs	402,000	482,000	− 80,000	−16·6

TUNIS

Classification	Numbers in		Increase (+) or decrease (−)	
	1921	1920	in number	per cent
Horses	74,245	74,249	−4	
Asses and mules	174,351	193,875	− 19·524	−10·1
Camels	132,196	140,762	− 8·566	− 6·1
Oxen	488,348	537,088	− 48·740	− 9·1
Sheep	2,037,551	2,182,749	−145·198	− 6·7
Goats	1,113,845	1,285,047	−171·202	−13·3
Pigs	17,636	18,699	− 1·063	− 5·7

NEW ZEALAND

Classification	Number on		Increase (+) or decrease (−)	
	31 January, 1921	31 January, 1920	in number	per cent
Horses	331,855	337,259	− 5,404	− 1·6
Cattle	3,273,126	3,139,223	+ 133,903	+ 4·3
Sheep (a)	22,245,473	23,285,031	−1,039,558	− 4·5
Pigs	380,026	349,892	+ 30,134	+ 8·6

(a) Number on April 30th of year indicated.

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